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how to get the most out of a radial arm saw

BY HOWARD SILKEN

PUBLISHED BY DEWALT (Division of The Black & Decker Mfg. Co.)

NOW equipped with Lower Blade Guard as standard equipment.

About the Author

Howard Silken is presently considered one of the foremost experts in the field of cutting. The radial arm saw first came to his attention in 1956 as a home-owners tool. Taking an intense interest in this comparatively new tool he instituted the first public demonstrations of it in New York City's Pennsylvania Station, Grand Central Station, the New York Coliseum and other places where the public gathers. Soon after he started the first school on Long Island, N. Y. that was open to the general public pertaining exclusively to the radial arm saw. The school is still in existence and this book is based on the 8 classes covering the variety of topics involved in cutting. He also conducts classes in the use of the router and professional wood finishing. To date, many thousands of men and some women have attended his school. In addition Mr. Silken has written many articles on tools for Mechanix Illustrated, Family Handyman and other publications.

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Note:
Catalog numbers of DeWalt Radial Arm Saws have changed to the numbers shown below:

R-1360 becomes No. 7740
R-1450 becomes No. 7770

Should you own one of the renumbered models, this book may still be used as a guide to operating your saw.

Special note:
Effective December 1973, saws illustrated in this book are equipped with Lower Blade Guards as standard equipment. All photos of saws are shown without Lower Blade Guard for purpose of clarity.

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Chapter 1
Introduction to the Radial Arm Saw

This manual has been prepared to show you how to get the most out of your radial arm saw. It is especially designed to apply to the 7770 or 7740 DeWalt saws. This does not mean that you cannot use it for almost any other model or for that matter any other brand. However, particularly in the chapter on alignment, you will find many references in italics. These will apply to *exclusive* features found in the Black & Decker DeWalt saws or *seldom found* in other brands. The DeWalt 7770 and 7740 are by far the finest radial arm saws, in their price range, on the market. When these machines were designed, three basic ideas were kept in mind, safety, accuracy and versatility. Safety features will be covered throughout the entire book, accuracy, mostly applying to alignment and versatility will be discussed in the section on attachments. I would suggest that you start at the beginning of the manual and work your way to the end doing each operation as described in order. In this way, you will familiarize yourself with the terminology and the machine itself. We start off with the simplest cuts and work our way up to the more complicated. If you jump around in the book you may miss some tricks or jigs that will come in handy later on. Most all other models of DeWalt saws operate in the same manner as the ones described in this manual. The locations of the adjustments may be different, therefore, just refer to the instruction manual supplied with your saw and relate it to what is stated or shown in this manual.

I have been teaching a course on the DeWalt saws for the past 15 years and have had over 8,000 students: men, women and boys. When I first started teaching I was asked many questions to which I did not have the answers. My stock answer to these questions at that time would be "that's a good question, however, we will take up that subject next week." That gave me time to work like mad and find the answers. After many years of seeking answers to hundreds of questions, I have dug up almost all the answers. One can never answer all of them for the limitations of these machines are only one's imagination.

If you own a DeWalt 7740 or 7770 you have purchased the best. Maintain it properly and it should last you 30 to 40 years. The entire idea in purchasing this machine is that it will pay for itself over and over again. Besides this, you will also enjoy it. It can be used creatively and constructively and will give you excellent results in spite of yourself. In other words, you don't have to be good to get good results. The accuracy is built into the machine, not the operator. The *secret* for expert results is in knowing how to set up the machine and keep it in good alignment. This manual, in addition to other things, will tell you how to do this.

Maintenance and Alignment. Each DeWalt machine is carefully aligned at the factory for perfect cutting. Therefore, you might ask, "Why bother with a chapter on alignment?" The answer is simple. Every time metal rubs against metal, a little bit wears away. Your DeWalt goes up and down, in and out and swings 360° in three directions. There isn't any position into which you cannot put the DeWalt saw—it is universal. As you use your machine, sooner or later, the metal to metal parts must wear and will need take-up. Fortunately, **every metal to metal part on your DeWalt saw can be taken up.** In this way, you can always keep the machine accurate and just as important, rigid. You might ask, "How often must I align the machine?" The answer is two fold. First, it will depend on the type of work you are doing. For building a house, for example, the machine does not need to be dead on the head. For building furniture it does. The second is, how often you use it. The more use it gets, the more often it will need alignment.

Exclusive. In this manual, before I even tell you how to align the machine I will tell you how to check to see if it needs alignment. If any part checks out to be in good alignment, leave it alone and go on and check out the next part. Be sure to check and align the parts in order. The accuracy of each adjustment is always dependent upon the accuracy of the preceding adjustment.

Shop Safety

The radial arm saw was engineered and manufactured to assure maximum user safety. Properly maintained and correctly operated it is one of the safest power tools you can own.

The proper and safe use of the radial arm saw is a main objective of this manual. In addition to the general safety rules that apply to all types of power tools (listed below), safety tips for radial arm saws are given throughout the manual as they apply to specific operations.

Look for and be guided by these safety tips. They are emphasized in the following manner:

SAFETY TIP Every electric tool, unless double insulated, should be grounded while in use to protect the operator against shock.

Safety Rules For Power Tools

A list of 18 "Safety Rules For Power Tools" has been adopted by members of the Power Tool Institute, Inc. as part of its continuing program to educate the consumer to safer usage of its product. Members of the Institute will identify their participation in the program by displaying the safety seal, shown above, and including the rules with their product. The rules apply to all types of power tools, both portable and stationary, including the radial arm saw.

The rules are as follows:

1. Know Your Power Tool—Read owner's manual carefully. Learn its applications and limitations as well as the specific potential hazards peculiar to this tool.

2. Ground All Tools—Unless Double-Insulated. If tool is equipped with three-prong plug, it should be plugged into a three-hole electrical receptacle. If adapter is used to accommodate two-prong receptacle, the adapter wire must be attached to a *known ground. Never* remove third prong.

3. Keep Guards In Place and in working order.

4. Keep Work Area Clean. Cluttered areas and benches invite accidents.

5. Avoid Dangerous Environment. Don't use power tool in damp or wet locations. And keep work area well lit.

6. Keep Children Away. All visitors should be kept safe distance from work area.

7. Store Idle Tools. When not in use, portable tools should be stored in dry, high or lock-up place—out of the reach of children.

8. Don't Force Tool. It will do the job better and safer at the rate for which it was designed.

9. Use Right Tool. Don't force small tool or attachment to do the job of a heavy duty tool.

10. Wear Proper Apparel. No loose clothing or jewelry to get caught in moving parts. Rubber gloves and footwear are recommended when working outdoors.

11. Use Safety Glasses with most tools. Also face or dust mask if cutting operation is dusty.

12. Don't Abuse Cord. Never carry tool by cord or yank it to disconnect from receptacle. Keep cord from heat, oil and sharp edges.

13. Secure Work. Use clamps or a vise to hold work. It's safer than using your hand and it frees both hands to operate tool.

14. Don't Overreach. Keep proper footing and balance at all times.

15. Maintain Tools With Care. Keep tools sharp at all times, and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

16. Disconnect Tools. When not in use; before servicing; when changing accessories such as blades, bits, cutters, etc.

17. Remove Adjusting Keys and Wrenches. Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.

18. Avoid Accidental Starting. Don't carry plugged-in tool with finger on switch.

Chapter 2
Maintenance and Alignment

Note—This chapter describes the maintenance and alignment of the models 7740 and 7770 DeWalt saws. If you have any other DeWalt power shop you will find the instructions to be almost the same. In most cases the instructions for the other models, in this book, will be found in parenthesis following the regular instructions. If you own any other brand of saw, check in your instruction manual for location of parts to be aligned and maintained. Note that any statement or description of parts shown in *ITALICS* indicates that the feature is exclusive with DeWalt or rarely found in other brands of radial arm saws.

Maintenance

When you receive your new DeWalt saw, it needs no lubrication. The machine has been partially aligned and all bearings are lubricated and sealed for life. In time, however, in order to keep the machine in perfect working order and accurate it will be necessary to lubricate and realign it. First we will discuss maintenance. The first thing that comes to mind is lubrication and logically we think of oil. This is the one thing we never use on a radial arm saw. If oil or grease is put on the surface of any moving part, sawdust will land and cling to the oil. The parts will move smoothly for a short time but soon the dust and oil will form a new substance commonly called "Gook." This really gums up the works. Instead of oil we use graphite for lubrication. It comes in powdered and liquid form. The powdered form is hard to handle and messy. The liquid is better and has an advantage. The liquid is usually a solvent. As a matter of fact, the machine needs more of a cleaning than a lubrication. When using the liquid graphite, the solvent dissolves the accumulated gums and resins from the wood and then evaporates leaving a thin coating of graphite. Some liquid graphites are in "lubricating oil." DO NOT use this type. Use the types that have deep penetration, such as "Liquid Wrench."

SAFETY TIP A rag soaked in any form of oil is subject to spontaneous combustion. Keep the rag you use in a covered metal coffee can. This way it can be used over and over again and stored safely.

Cleaning and Lubrication

The Track and Roller Head Bearings—Push the roller head all the way back. With a soft rag wet with liquid graphite wipe the track clean on both sides from the roller head to the end cap.

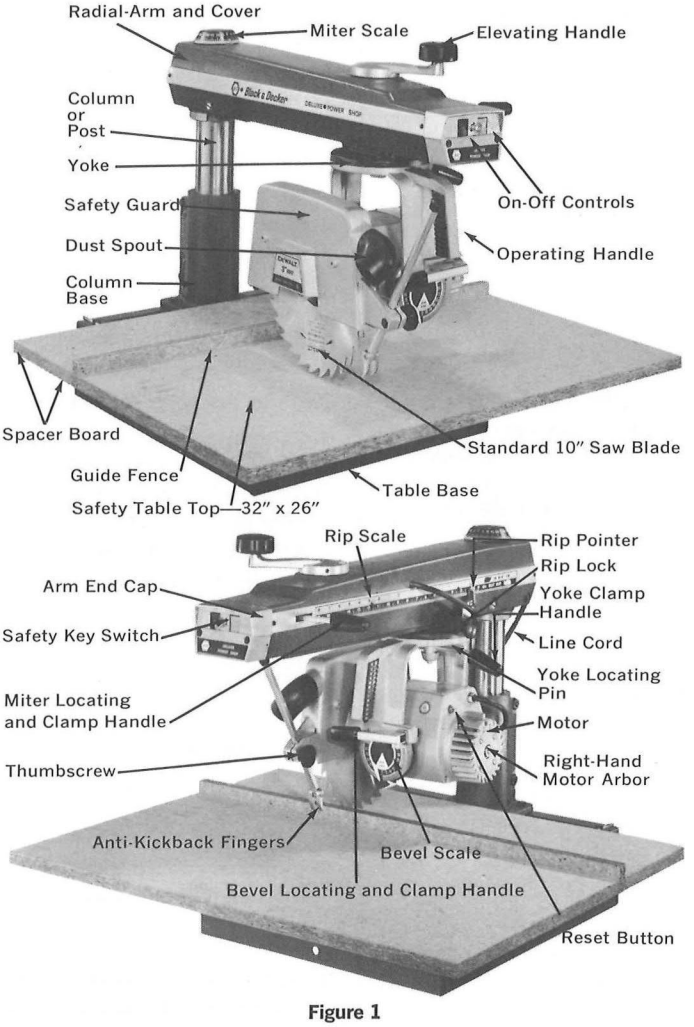


Figure 1

SAFETY TIP The milled track edges of the cast iron arm are sharp and will cut through the rag. If the rag is not thick enough these edges will cut your fingers.

Now pull the roller head all the way forward and clean the back end of the track. For excellent results, the track should be cleaned periodically preferably after each time you use the saw. The roller head bearings do not need lubrication but they too should be cleaned. To do so, place the rag with the liquid graphite on the inside edge of the two front bearings and push the roller head back and forth at the same time. This will revolve the bearings against the rag. Continue this until the bearings are clean. Do the same to the rear bearings. One of the first indications that the track and roller head bearings need cleaning is a bumpy or binding feeling as you push the roller head back and forth. This almost always happens after using the sanding disc.

TROUBLE SHOOTING CHART—MOTOR

Trouble	Probable Cause	Remedy
Motor will not run.	1. Protector open; circuit broken. 2. Low voltage. 3. Bad capacitor or starting relay.	1. Reset protector by pushing on red button (indicated by audible click). 2. Check power line for proper voltage. 3. Replace capacitor or starting relay.
Motor will not run and fuses "BLOW."	1. Short circuit in line cord or plug. 2. Short circuit in junction box, or loose connections.	1. Inspect line cord and plug for damaged insulation and shorted wires. 2. Inspect all terminals in motor junction box for loose or shortened connections.
Motor fails to develop full power. (Power output of motor decreases rapidly with decrease in voltage at motor terminals.)	1. Power line overloaded with lights, appliances and other motors. 2. Undersize wires or circuit too long. 3. General overloading of power company's facilities. (In many sections of the country, demand for electrical power exceeds the capacity of existing generating and distribution systems.) 4. Incorrect fuses in power line.	1. Reduce line load. 2. Increase wire sizes, or reduce length of wiring. 3. Request a voltage check from the power company. 4. Install correct fuses.
Motor starts slowly or fails to come up to full speed.	1. Low Voltage—will not trip starting relay. 2. Starting relay not operating. 3. Bad capacitor.	1. Correct low voltage condition. 2. Replace relay. 3. Replace capacitor.
Motor overheats.	1. Motor overloaded. 2. Improper cooling. (Air circulation restricted through motor due to sawdust, etc.)	1. Correct overload condition. 2. Clean out sawdust to provide normal air circulation through motor.
Starting relay in motor will not operate.	1. Burned relay contacts (due to extended hold-in periods caused by low line voltage, etc.) 2. Open relay coil. 3. Loose or broken connections in motor terminal box.	1. Replace relay and check line voltage. 2. Replace relay. 3. Check and repair wiring.
Motor stalls (resulting in blown fuses or tripped circuit breakers).	1. Starting relay not operating. 2. Voltage too low to permit motor to reach operating speed. 3. Fuses or circuit breakers do not have sufficient capacity.	1. Replace relay. 2. Correct the low line voltage condition. 3. Replace fuses or circuit breakers with proper capacity units.
Frequent opening of fuses or circuit breakers.	1. Motor overloaded. 2. Fuses or circuit breakers do not have sufficient capacity. 3. Starting relay not operating (motor does not reach normal speed.)	1. Reduce motor load. 2. Replace fuses or circuit breakers. 3. Replace relay.

Post (or Column)—Elevate the arm as high as it will go. Wipe the post clean with a rag and liquid graphite. Squirt a little liquid graphite where post and key enters base.

Roller Head—This hardly ever needs any attention. Once every three or four years I suggest you remove the roller head from the track and unscrew the king bolt from the yoke lock lever. This will separate the yoke from the roller head. You can then clean the two surfaces and also clean the yoke locator pin.

Motor tilts in yoke on a two point suspension. Another word for tilt is bevel and in the rest of this book we will refer to this positioning of the blade with the word "bevel." The two points of suspension can be lubricated by a squirt of liquid graphite.

Yoke Locator Pin—See above paragraph on Roller Head.

Bevel Locator Pin—This can be lubricated by simply pulling it out and applying a few drops of graphite on it. It is spring loaded and you can just work it in and out until it moves freely.

Elevating Screw—On some of the older models of the DeWalt, the post has an opening on the right side that exposes the elevating screw. A few squirts of graphite on the screw will keep it going freely.

Electrical System

Motor Overload Protection. Your Saw Motor is equipped with a manual-reset overload protector. If the protector "trips" and stops the motor, take the following steps:

1. Press the STOP button on the front of the arm.

2. Allow motor to cool (normally ten to twenty minutes), and then press the red RESET button. If you do not hear a "click," allow the motor to cool further until you do hear a "click" when the button is pressed.

3. After the reset is accomplished, the saw may be started by pressing the START button.

GROUND WIRE

Most tools today are grounded by a third wire that goes from the metal parts of the tool to one prong of the plug.

SAFETY TIP If your outlet looks like Figure 2, a special grounding adapter is available. The pigtail wire on the adapter must be connected to a permanent ground as shown in Figure 2.

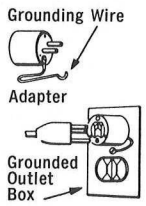


Figure 2

If you have a unit that can be run on 220 volts and you wish to do so, you must use a plug and receptacle as shown in Figure 3. No adapter is available for this receptacle.

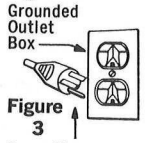


Figure 3
Grounding Blade is the Longest of the 3 Blades

SAFETY TIP Never use the machine unless it is properly grounded.

Alignment

The beauty of a radial arm saw is its accuracy. However, it will only be as accurate as you can keep it. The next section of this book is probably the most important to you craftsmen who intend doing fine cabinet or furniture making.

There are several things to be done before you will be ready to align your saw.

Have ready the following tools.

Wrenches needed to tighten the adjusting bolts and allen screws. Two slotted screw drivers and a phillips screw driver. A set of allen wrenches. A *square* square.

Be sure to check the following adjustments: (For most DeWalt saws; for other saws the theory is the same but the location of the parts is different. **See owner's manual.)**

Be sure that the roller head fits snugly in the track.

Locate the arm in the 90° cross-cut position.

Push the saw all the way back.

Place each thumb on a front roller bearing of the roller head.

Grab the yoke assembly with your fingers and draw the saw forward.

At the same time, press on the roller bearings with your thumb as hard as you can. If you can stop the bearings from turning they are too loose.

Now check the back bearings.

Press your index fingers on the back bearings as hard as you can and draw the saw forward.

If you can stop the bearings from turning they are too loose.

After checking the bearings if you find dirt on your finger tips the track and bearings need cleaning.

Use liquid graphite.

NEVER USE OIL for cleaning or lubricating the parts of your saw.

If you have found that the bearings are not snug in the track:

Draw the saw to the end of the arm with your left hand.

Release the yoke lock and yoke locator pin with your right hand.

Swing the assembly into the out-rip position with your left hand.

Lock the yoke lock with your right hand.

Push the saw back about 4 inches.

Bend down and look under the yoke assembly for two holes which are directly under the left hand roller bearings. It is through these holes that you will adjust the bearings with an allen wrench.

The bearings are mounted on off center or eccentric

shafts that are locked in place by hex nuts located directly under the roller head.

Loosen the hex nuts.

Pass an allen wrench through the front hole in the yoke into the broached hole in the shaft that holds the front bearing.

Turn this allen wrench in either direction. One direction will drive the bearing against the track and the other will draw it away.

Turn the allen wrench to drive the bearing against the track.

Move the roller head back and forth as you turn the allen wrench until you feel a drag.

Lock the front bearing shaft by tightening the hex nut that holds it in place.

Adjust the rear bearing in the same manner.

A proper adjustment of the roller head is of extreme importance.

TABLE ADJUSTMENT

It is absolutely necessary that the table top be mounted parallel to the arm of your saw. To do so proceed as follows:

Remove the guard, the blade and the washers from the motor.

Elevate the saw about 20 turns.

Release the bevel lock lever and pull the bevel locating pin.

Revolve the motor until the arbor is 90° to the table (pointing down).

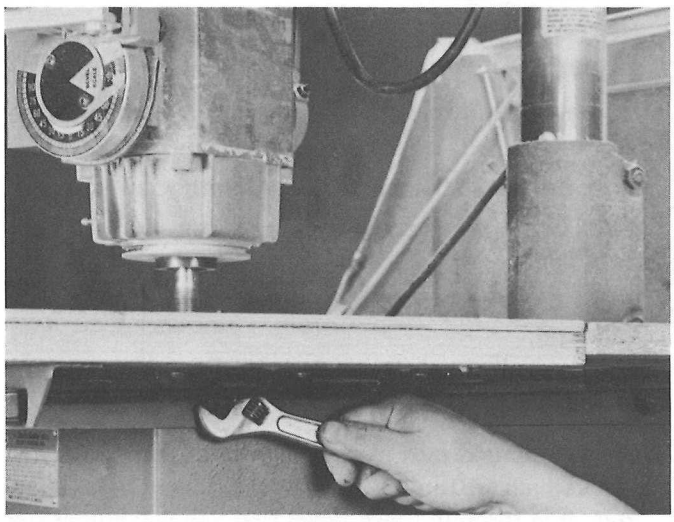


Figure 4

The table must be parallel to the arm. Position the end of the arbor directly over each grab nut. See text for adjusting instructions.

Release the miter lock and locator so you can move the arm to the right and left.

Lower the arm until the end of the arbor is just above the table.

Bend down so that your eye is even with the table top.

Move the arm to the right and left and push the roller head back and forth and notice if there is any change in the distance between the end of the arbor and the top of the table.

If the clearance (distance) is the same over the entire surface, the table is parallel to the arm.

If there is a difference in clearance adjust as follows:

Position the end of the arbor directly over the highest point on the table. Look under the table and you will notice four grab nuts that hold the steel angle rods to the base. Now position the end of the arbor directly over the nearest grab nut to this high point. Lower the arbor until it touches the table. (You may have to adjust one, two or three nuts to get the table parallel.) Now move the arbor directly over the lower grab nut. Loosen the grab nut and push the table up until it touches the end of the arbor. **Tighten** the grab nut. Adjust the other grab nuts if needed in the same manner.

After you have adjusted the table to be as parallel to the arm as you can get it I suggest that you attach a ¼" piece of plywood to the table top covering it from the fence forward. This laminating procedure I will describe at the end of the chapter. It can be done now or after you have completed the entire alignment.

If you now wish the table top to be level with the earth or even with an existing work bench use wedges under the base or legs to bring the entire machine to the position desired. Now fasten the machine to the floor or whatever supports or table you have. There are pre-drilled holes in the bottom of the base for this purpose.

ARM END PLAY ADJUSTMENT

Although the table may now be parallel to the arm we still cannot align the saw until we have eliminated any end-play in the arm. To check for end-play proceed as follows:

Place the blade on the arbor and tighten.

Locate the arm at the 90° miter position and lock it tight with the miter lock.

Have the blade 90° to the table and be sure that you have the yoke lock tight.

Pull the saw all the way out to the end of the arm with the blade about ⅛" above the table. Lock the rip lock.

With your left hand on the left front corner of the table and your right hand on the end of the arm, pull the

arm to the left and mark the location of the blade on the table when you release your pressure and the arm springs back to its relaxed position.

With your right hand on the right front corner of the table and your left hand on the end of the arm, pull the arm to the right. Now let it spring back.

If it does not spring back to the original mark you have end-play. You can get this end play down to less than 1/32" as follows:

Make sure that the bolts that hold the column base to the table base are tight.

Make sure that the base that supports the post fits snugly around it. This can be done as follows: Loosen all base hardware above table frame level (4 pieces). These are: Two pinch bolts with lock nuts and two brass set screws with locknuts.

Raise & lower column:

(A) If base is too tight around column causing it to bind, turn pinch bolt lock nut toward right hand side until column moves freely. Then tighten pinch bolts firmly while holding lock nuts in place.

(B) If base is too loose around column causing play, tighten pinch bolts until play is removed and column moves smoothly in base. Then tighten lock nuts against left hand side of base.

To prevent side motion of the arm (rotation of column) tighten the top and bottom brass set screws against the column key. Be careful you do not tighten to the point of binding with resulting hindrance to the elevating. Lock by tightening jam nuts.

You now have eliminated any end play caused by the turning or the rocking of the post in the base. Occasionally some end-play comes when the arm is not securely locked to the post. This can be eliminated by tightening 2 allen socket screws located on the back split of the arm. One allen socket screw can be reached through a hole in the casting, the other can only be reached by removing the shroud. These allen socket screws are locked against one side of the casting with lock nuts. Loosen these lock nuts. Now pull the miter (arm) lock lever and push the arm a few degrees to the left. With an allen wrench tighten one of the allen socket screws with your right hand as you move the arm back and forth with your left hand. When you feel a drag in your left hand the screw is properly adjusted. Lock its lock nut and follow the same procedure with the other allen socket screw.

Bring the arm to the 90° cross cut position and lock it. (If it does not lock firmly check with your existing parts manual and follow the instructions on how to take up this adjustment.)

You should now have eliminated any end-play in your machine.

ARM ADJUSTMENT

With the roller head snug in the track, the table parallel to the arm and no end-play you are now ready to align your saw.

The first check is to be sure that the arm is square (90°) to the fence.

Unplug the machine and remove the guard. (The blade should be on the arbor.)

Locate the arm in the square position and lock it. Position the roller head so that the blade is about 1" in front of the fence and 1/16" above the table.

Place a square against the fence on your left hand side flat on the table. Move it to the right snug against the fence until it just touches one tooth of the blade. Hold it there with your left hand.

Grab the front of the blade with your right hand and rotate the blade slightly and listen to the teeth scrape against the square.

Pull the saw forward by pulling on the blade until it is out to the end of the square. As you pulled it did the bottom tooth scrape along the square? If it did, without pushing the square to the left, the arm is square to the fence. However, if it *moved away from the square to the right* or *if it pushed the square to the left* it is too far to the right or the left.

If the arm is too far to the right adjust it as follows:

Release by pulling the miter or arm lock.

Look under the arm in front of the post and notice the miter locator. It pivots between 2 large adjusting screws that are threaded into the right and left side of the arm casting. Look directly under these screws and notice 2 holes in the casting with allen screws in them. These allen screws when tightened press small 1/4" brass discs against the adjusting screws that hold the miter locater. In order to turn the adjusting screws these allen screws must be loosened a half a turn.

Loosen the right adjusting screw about 1/4 turn. Tighten the allen lock screw.

Tighten the left hand adjusting screw and at the same time pull the locator lever in and out. The locator is spring mounted and if you tighten the adjusting screw too tight the spring will not pull the locator into the pre-grooved slit on the post. If this happens loosen the adjusting screw minutely and check that the locator is being pulled fully into the groove. Now lock the adjusting screw by tightening its allen lock screw.

The arm should now relocate itself slightly to the left. Check again with the square. If it is still not square repeat the operation just completed. This adjustment is strictly trial and error. If you have over-adjusted or if you found the arm located too far to the left rather than to the right reverse the procedure. (Loosen the left adjusting screw and tighten the right.) **Important**

—Be sure to tighten the allen lock screws firmly. Each time you pull the locator lever the locator itself turns between the adjusting screws. If they are not locked they too will turn drastically changing the adjustment.

Sometimes it will take as little as 1/32 of a turn to adjust the arm square to the fence. (On other model DeWalts the adjusting screws are on the left side of the arm but the procedure is identical to that described.)

To check this for square under operating condition, make a cut on a piece of 1 x 12 lumber and check it with your carpenter's square.

When you are sure that you have adjusted the saw for square, look at the miter scale and see if the pointer reads 0°. If it does not, move it until it does.

BLADE 90° TO TABLE

Position the saw blade so that it is 90° to the fence, 90° to the table and the bottom of the blade is 1/8" above the table and 1" in back of the fence.

Place your square with one leg on the table and against the fence. Move the square to the right until the other leg of the square is against the left side of the saw blade. Bend down even with the blade and see if the blade is square to the table.

If the blade is not square to the table adjust as follows:

Remove the screws that hold the plate on the front motor pivot. You will notive two large socket head screws.

Loosen these two screws and you will notice that the entire motor will rock.

Position the blade square by holding the square snug against the table and the blade. Tighten the socket head screws each one a little bit at a time. (Tightening one very tight has a tendency to shift the adjustment.)

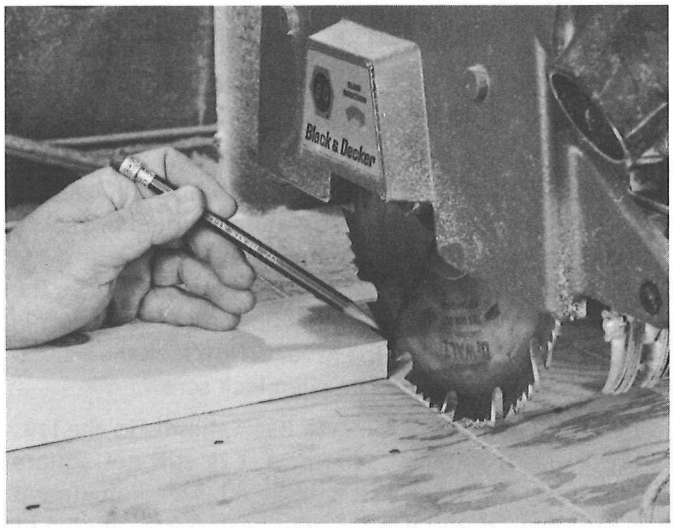


Figure 5

The end of this piece of wood was just trimmed and not moved, yet, the rear of the blade is not touching the wood. This indicates a miss-adjustment of the upper kerf screws.

The blade is now square to the table. Replace the cover plate and bevel pointer so that the pointer now reads 0°.

To check this under operating condition, make a cut on a piece of 1 x 12 lumber and check it with your carpenter's square.

You cannot adjust the saw at any other angle other than the two you have just completed. Once these are correct at 90° they will automatically be correct at 45°.

KERF ADJUSTMENT: This next and last adjustment is the most important adjustment on the saw. The kerf is the cut that the saw blade makes. It is vital that the rear of the blade is always in line or directly in back of the cut that the front of the blade is making. In cross-cutting, if the rear of the blade is to the left it will push the lumber to the left causing an angular cut. In other words, if the arm is 90° to the fence but the blade is cocked at a slight angle the cut will not be square. It will be off the same number of degrees at which the blade is cocked. In the rip position, the blade will not be parallel to the fence if the kerf is not adjusted properly. If the rear of the blade is closer to the fence than the front of the blade we have a condition commonly called a heel. This condition will cause the blade to force the lumber against the fence and the work will bind between the blade and the fence. If the heel is slight and the blade is thin the rear of the blade will actually bend away from the fence but will tear the upper corner of the work being cut as the end of the work passes the rear of the blade. If the front of the blade is closer to the fence than the rear of the blade we have a condition commonly known as a toe. Under this condition as you feed the lumber the blade will have a tendency to push the work away from the fence. You will not have a binding problem but it will result in a tapered rip. (This is one method of ripping a taper but it is not recommended. Other methods will be discussed later in the book.) The kerf can be adjusted with the saw in the cross-cut or rip position, however, it is best to adjust it in the cross-cut position for the following reasons: a toe or a heel can be introduced when the saw is in the rip position by moving the arm slightly to the right or left of the square position. With the saw in the in-rip position moving the arm to the left would introduce a heel, moving the arm to the right would introduce a toe. With the saw in the out-rip position they reverse themselves. If you adjust the kerf adjustment in the rip position and you are not aware that the toe or heel is caused by the arm not being 90° you will get the blade parallel to the fence but the kerf will be off in the cross cut. If you wish to adjust the kerf in the rip position **be sure that the arm is 90° to the fence and has no end-play.** Radial arm saws cannot rip properly unless they cross-cut square. This is another reason why you must align your machine in the proper order.

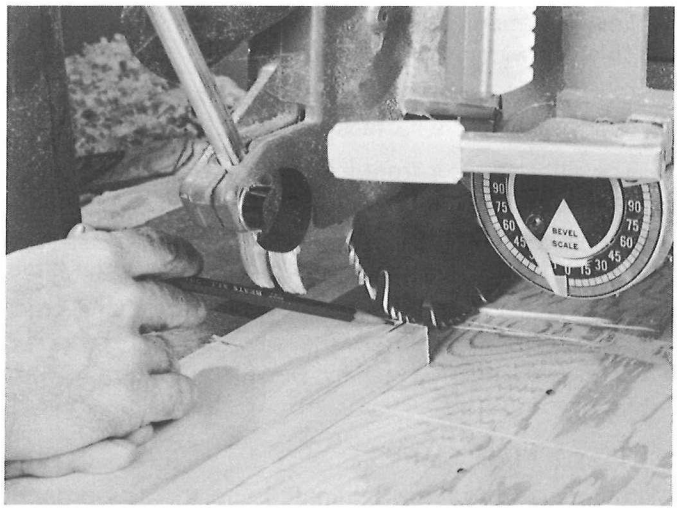


Figure 6

To check that the blade is parallel to the fence for ripping, rip a short cut in the end of a piece of scrap wood. With the saw TURNED OFF see if the other end of the blade goes into the groove just cut. See text for adjustment if the blade is not parallel.

To adjust the kerf proceed as follows:

Notice that the motor pivots on 2 suspension points in the yoke.

The front pivot or bearing (also called the trunion) is a large metal disc that is bolted to the motor and has pre-drilled holes into which the bevel locator pin falls.

The rear bearing or trunion is a small ring about ¾" in diameter held in place in the yoke by 3 opposing allen screws. One screw points up and the other two point down from the right and left. Each screw has a lock nut to secure it. In the center of this ring is a large bolt. The head of this bolt is turned to a snug fit in the ring and the bolt threads into the back of the motor.

No matter how you bevel the motor these three screws always remain in the same position. By adjusting these screws you can move the rear of the motor up or down and/or right and left. These three point suspension screws are an exclusive feature with DeWalt saws.

Adjust the bottom screw first so that the blade is parallel to the table as follows:

With the saw **Unplugged,** the blade on the arbor and the guard removed, elevate the arm about 25 turns.

Rotate the motor 90° by releasing the bevel lock and locator. The blade should now be parallel to the table.

To check for parallel place a block of wood about 2" tall on the table under the front edge of the blade. Lower the blade until its teeth just graze this block of wood.

Leave the blade in this position and place the same block of wood on the table under the rear edge of the blade. If the teeth of the blade just graze the block of wood the blade is parallel to the table.

If there is any distance between the block and the blade, the rear of the blade is too high. If you cannot get the block under the blade, the rear of the blade is too low.

If the rear of the blade is too low—

Loosen the 3 lock nuts on the 3 allen kerf screws.

Loosen the 2 upper screws a few turns.

Tighten the lower allen kerf screw and push the rear pivot of the motor up until the blade is parallel to the table.

Tighten the lock nut on the lower allen kerf screw.

Tighten the 2 upper allen screws but do not lock them yet.

If the rear of the blade is too high—

Loosen the bottom screw.

Sometimes this alone will cause the rear pivot to come down, but generally you must push it down by tightening the 2 upper allen screws.

When the blade is parallel to the table lock the bottom allen screw with its nut.

To adjust the upper screws rotate the motor so that the blade is now 90° to the table in the cross-cut position.

Lower the arm until the blade is about ¼" above the table and about 1" in front of the fence.

Hold the block of wood about 3" tall lightly against the front left side of the blade.

With your right hand rock the blade up and down so the teeth just scrape against the block as you hold the block with your left hand.

Hold the block firmly with your left hand and pull the saw blade forward with your right hand so that the rear left side of the blade is alongside the block.

Rock the blade up and down as before. If the amount of scraping is the same you will know that the rear of the blade is directly in back of the front of the blade as it should be.

If you have no scraping the rear of the blade is too far to the right. To correct this loosen the upper left hand screw and tighten the right one the same amount until the rear of the blade follows the front.

If the rear of the blade is pressing against the block and you can't turn it or it is hard to turn, then the rear of the blade is too far to the left. To correct this loosen the right hand screw and tighten the left hand screw.

This adjustment is trial and error and a few checks are needed to get it correct.

Once you have the screws properly set, lock them with their lock nuts.

You now have completed the alignment of your saw.

I now suggest you cover the work surface of your saw with ¼" plywood. Do not use masonite because it is too hard and will take the keen edge off your blades. Plywood thicker than ¼" causes problems with certain at-

tachments and interferes with wide rips. Cover the table top from the fence, in its normal position, all the way forward. The top can be adhered to the original surface with brads, recessed screws or best of all rubber cement. If you use brads or screws make sure of the following:

That they are set below the surface so they will not scratch your lumber.

That they are not in line with the common saw cuts.

That you use enough of them to keep the ply top very snug to the original work surface.

That you mark the brads or screws with a dab of paint or crayon so that if an odd angle is cut you will see the brad before you hit it.

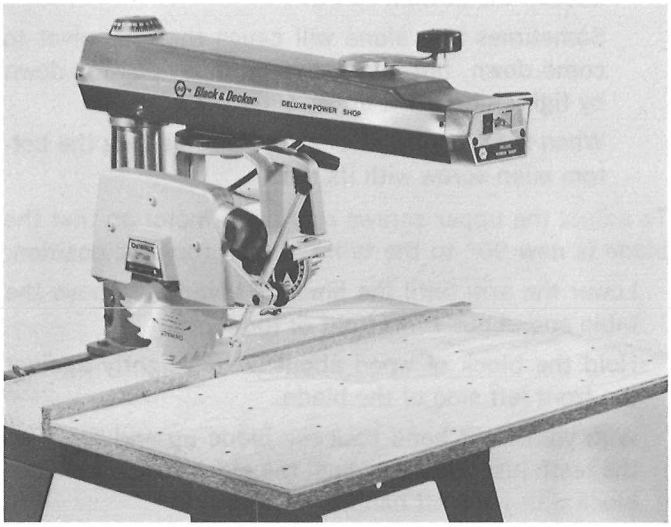


Figure 7

Note the number of brads and the suggested locations that hold the plywood to the original table. Each one has been clearly marked. See text.

If a brad or screw is in the way of a cut remove it, set it lower or better still, place another piece of plywood on the top and engage the blade into this new scrap. This way you will keep the original cover free from extra cut marks and you will not have to change it too often.

If you prefer to glue the top, use rubber cement so that it can be removed after it is all cut up.

After the work top has been laminated and you wish to do precision cutting, the new ply top that you just installed can be forced to a precision parallel to the arm by surfacing it with the machine itself. To do so proceed as follows:

Remove the fence.

Attach the sanding disc to the arbor.

Drop the disc to the horizontal position.

Lower the arm until the disc just strikes the highest part of the ply surface.

Turn the saw on and move the arm to the right and left and push the roller head back and forth. This will sand off the high spot.

Lower it about $\frac{1}{8}$ of a turn and repeat the operation. This will widen the sanded spot.

Continue this operation a little at a time until you have sanded the entire surface that the disc will reach.

The right and left front ends of the ply top will not be sanded. If they are high, use a straight edge on the sanded part of the table as a guide and sand high ends by hand until they are even with the rest of the table.

This is only necessary for those who are doing precision cutting on the machine. The new chipboard surfaces now being used by DeWalt are literally warp proof.

CUTTING KERF MARKS

With your saw top now laminated and the saw properly aligned you should now cut into the laminate the most common kerf marks. To do so proceed as follows:

Change the fence.

Make the new one $\frac{1}{4}$" higher than the one supplied.

The total height should be $1\frac{3}{4}$".

To cut the common kerf marks proceed as follows:

Locate and lock the arm 90° to the fence. Locate the blade 90° to the table.

Draw the saw out to about the middle of the track and lower the blade until it just grazes the ply top.

Turn the saw on and push roller head all the way back. This will cut the fence and lightly score the ply top.

Lower the arm (saw still running) $\frac{1}{4}$ turn. Pull the saw forward to the end of the arm with your **Left Hand.** This will cut a groove in the plywood $\frac{1}{32}$" deep. Tighten rip lock.

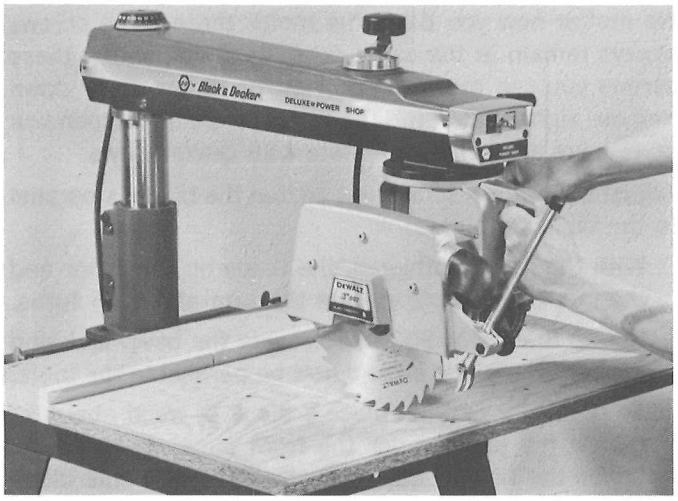


Figure 8

With the saw drawn all the way out release the yoke lock and locator pin with your right hand.

With the saw still running and your left hand still on the handle release the yoke lock with your right hand and pull it hard enough so that the yoke lock lever presses against the yoke locator pin bell pushing the

yoke locator pin out of the hole in the roller head. You can now rotate the saw blade in a clock-wise direction. Release the pressure on the bell and continue rotating the blade until the spring mounted yoke locator pin falls into the next hole. You have now cut in the ply top a ¼ turn groove known as the swing line. The saw is now in the in-rip position. Loosen rip lock.

Figure 9

With the motor running, carve ¼ turn swing line while saw is at the end of the track.

Exclusive Feature. *Note that the yoke locator pin locates itself in the roller head which is cast-iron. This prevents the holes from elongating after many years of use.*

Once the ¼ turn cut is complete lock the yoke with your right hand and with the blade still revolving push the yoke back on the track until the blade reaches the fence. This will cut the rip trough in the center of the table. Stop motor.

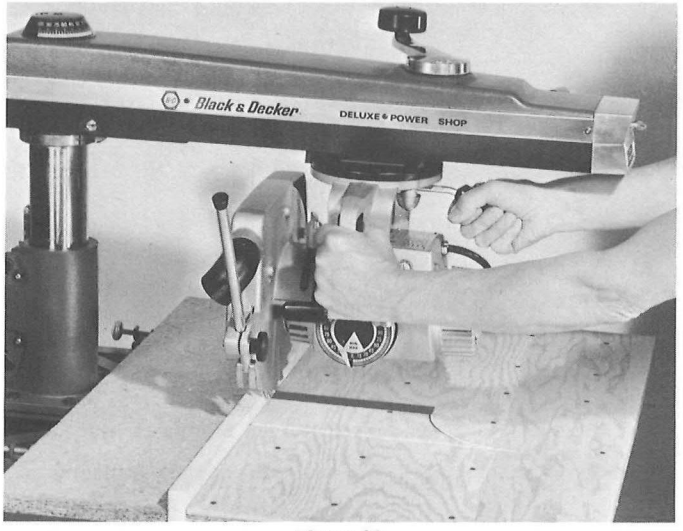


Figure 10

With the motor running, push the saw blade to the fence carving in-rip trough. Trough in photo has been darkened to better show its approximate width. Note even cut marks in fence caused by the set on the teeth of the saw blade. This indicates blade is parallel to fence (as it should be).

To return the saw to the cross-cut position reverse the procedure as follows:

Draw the saw all the way out with your left hand.

Release the yoke lock and disengage the yoke locator pin with your right hand.

Swing the saw into the cross-cut position with your left hand.

Lock the yoke lock with the right hand.

Push the saw all the way back with the left hand.

Once the kerf cuts have been made, the above procedure can be done with the saw not running if you wish.

The three cuts you have just made will enable you to convert the saw from a cross-cut saw to a rip saw without raising and lowering the arm. However,

It is advisable to continue the trough for wider or out-rips.

So repeat the first operation again but swing the saw counterclockwise at the end of the track, scribing a new curve in the out-rip position.

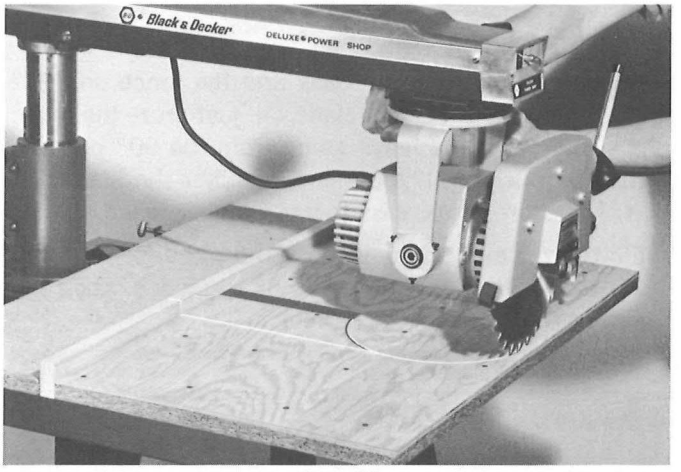


Figure 11

Swing the saw to the out-rip position carving new ¼ turn out-rip swing line. Lock yoke lock with right hand.

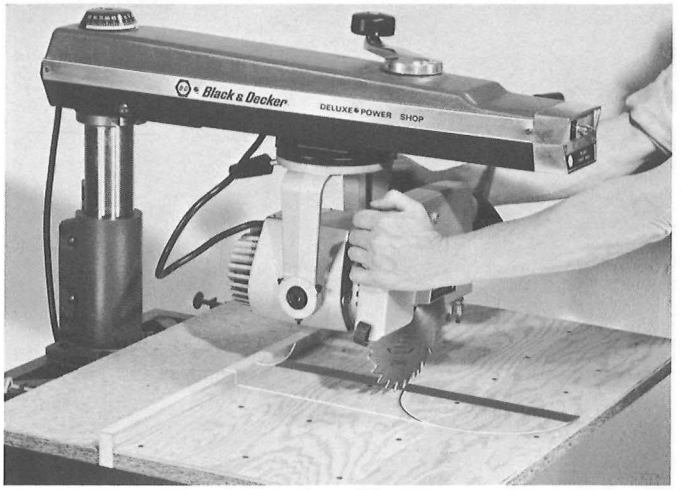


Figure 12

With motor running, push saw in carving out-rip trough until it meets the in-rip trough.

When the blade is parallel to the fence the locating pin will fall into place.

Push the saw in until the trough it cuts meets the first trough you made.

SAFETY TIP When converting from a cross-cut to a rip or vice versa, **do not pull the saw out fast** and hit the end cap with a great deal of force. If you batter or ram at the end cap too hard too often you may crack it or strip the screws.

The two miter cuts

Arrange the saw in a position to make a 90° cross-cut. (The arm 90° to the fence and the blade 90° to the table.)

Have the bade about 1/32" into the table (ply top) and the saw all the way back.

Release the arm lock and the locator lever.

With your left hand on the end of the arm push the arm to the right until the arm is located at 45°.

The locator will fall into place at 45°.

Lock the arm.

If the saw was all the way back and the fence only 3/4" above the work surface the blade will just graze the fence as it swings past the fence going from the 90° position to the 45° position. If the fence is higher the blade will hit it. Therefore, if you wish to use a higher fence,

Elevate the arm and swing it to the right and left until the blade just grazes the top of the fence. Lock the saw on the arm with the rip lock.

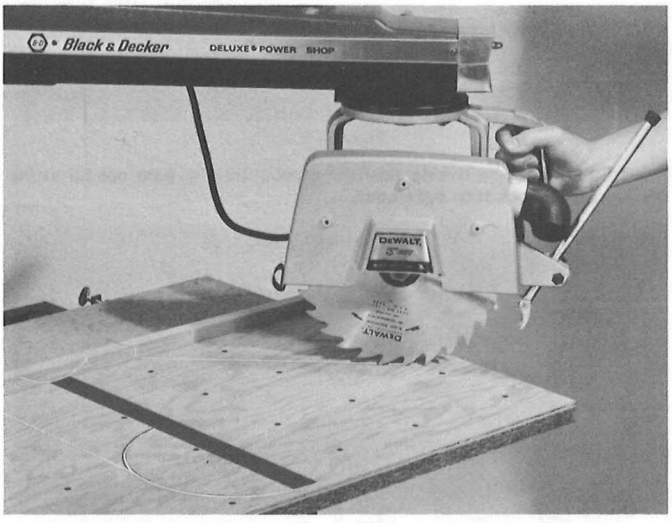


Figure 13

Carve the right hand miter with the blade engaged into the table the same depth as the 90° cross cut, swing line and rip troughs.

With the saw running lower the arm 1/4 turn at a time and move the arm to the right and left each time cutting a little of the fence away.

Continue this until the bottom of the blade is about 1/32" below the top of the ply.

Locate the saw at 45°R.H. miter and pull the saw out kerfing the table.

The final kerf cut.

Return the saw to the basic cross-cut position (90° miter and 90° bevel).

Draw the saw half way out and elevate it 16 or 17 turns.

Put your left hand on the upper part of the anti-kickback rod and release (pull) the bevel lock lever and locator with your right hand.

Start to rotate the motor in a counterclockwise direction.

Release the locator pin after you start the rotation. It will automatically fall into place when the saw is in the 45° position.

Lock the bevel lock with your right hand.

Turn the saw on and lower the arm until the blade just grazes the ply top.

Push the yoke all the way back cutting the fence.

Lower the arm about 1/16" (1/2 turn) and draw the saw forward.

You should now have a V groove in the rip trough you made just before. This cut is known as the bevel miter kerf cut.

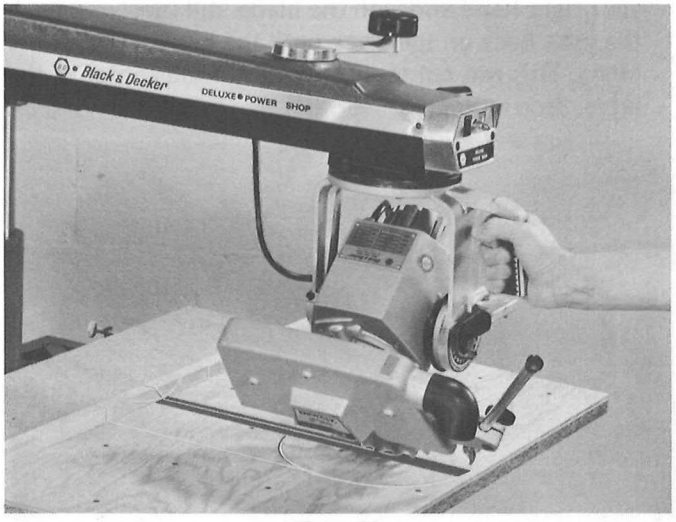


Figure 14

Saw at 45° bevel. Pull it forward with the left hand to carve 1/16" deep kerf cut in rip trough.

Chapter 3
Saw Blades

Your DeWalt saw comes with a 10″ guard and blade. *It will enable you to cut 3″ deep.* This does not mean that a 10″ blade on any other radial arm saw will necessarily cut the same depth. The limiting factor to the depth of cut is the clearance under the motor. The motor on your DeWalt saw is made by DeWalt and is especially designed to give you maximum depth of cut. Most other brands of radial arm saws use ordinary electric motors with external covers thus limiting the depth of cut.

The ability of a blade to cut properly depends upon three basic factors:

1. The design and shape of the teeth of the blade.
2. The power and speed of the motor.
3. The material you are cutting.

This chapter will discuss the interrelationship of these basic factors.

Power needed to drive a saw blade depends on the hardness of the wood you are cutting, the sharpness of the blade, the cut you are making (basically rip or cross-cut), the clearance of the kerf, the type of blade you are using, the speed of the rim of the blade (tip speed).

The quality of the cut depends on the wood you are cutting, the sharpness of the blade, the type of blade, the number of cuts per inch. The more cuts per inch the smoother the cut.

Different blades are available to cut the following materials: Woods (natural). Woods (artificial): plywood, masonite, novaply, lebenex, etc. Metals (ferrous): iron & steel; (non-ferrous): brass, bronze, aluminum and others. Ceramics: tile, brick, stone, slate, marble, porcelain, glass. Plastics: fiberglas, plexiglass, lucite and nitrose acetate, etc. Paper, cardboard and cloth.

We will now discuss the above items one at a time. Power needed to drive the saw blade depends on:

Hardness of the wood.

Any wood that comes from a tree that has leaves is termed hard wood; wood that comes from a tree that has needles is termed soft wood.

However, some pines (yellow pine for flooring) is much harder than some mahoganies or poplars. Also, by definition, balsa wood (extremely soft) is technically a hard wood.

For practical reasons then we will refer to the hardness by how hard or dense the wood is.

Some of the popular softer woods in use are mahogany, poplar, pine, redwood and cedar. Popular hard woods are maple, oak, birch, walnut, cherry, ebony, ash, hickory and teak.

You will need a more powerful motor to cut hard woods if they are thick and depending on the wildness of the grain (especially in cherry). This factor will be discussed later on page 15 (the kerf of the blade).

The sharpness of the blade.

A dull blade requires more power than a sharp one. The

following are the causes for a blade becoming dull.

Prolonged use.

Harder woods dull a blade faster than soft woods.

Improper sharpening, set or jointing generally cause overheating.

Paint, varnish, etc. and dirt on the wood.

Hitting a nail (even a small one).

Misalignment of your saw—especially a heel in the rip position.

Fireproofed lumber.

Glues, resins and binders in the plywood, novaply, masonite, etc.

The cut you are making.

Generally it takes more power to rip a piece of lumber than to cross-cut it. (4 to 7 times more power.) This factor changes with the different types of wood. The harder the wood the smaller the difference in power needed.

Miter cross-cutting at an angle up to 45° is basically a cross-cut and requires only slightly more power than a 90° cross-cut.

In rip cuts the lumber sometimes closes the kerf and grabs the blade. This will be discussed in chapter 4 (kerf).

Cross-cuts also are subject to the closing of the kerf or binding of the blade especially on lumber about 8″ to 12″ wide. This pinching effect is so strong it will bind even large HP saws. This effect can be alleviated by artificially increasing the kerf—

If, as you draw the saw forward, you notice the blade slow down due to binding, do not draw it forward any more.

Push it back and let the blade reach full speed.

Now make the cut again. You will recut the closed cut. (Figure 15)

The binding may occur again and you will have to repeat the cut a few times, or

If you wish, after the first bind occurs, you can move the stock slightly to the right or left (depending on which piece you want) and put a new cut right alongside the first one. This will give you a new kerf wide enough to continue the cross-cut on the second cut.

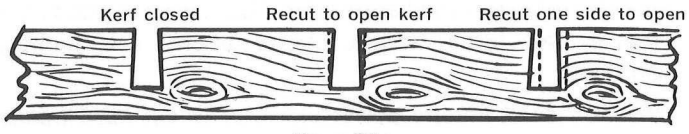


Figure 15

Cross-cuts sometimes jam or run up on the lumber.

This will happen often to inexperienced operators.

It will also occur on a saw without the proper drag on the roller-head. (see alignment)

This jamming should not be confused with the binding just discussed.

A bound blade is difficult to remove from the slit it is in after the saw has been turned off.

A jam occurs because the blade is advancing faster over the lumber than the teeth can cut it away.

Because our cross-cuts are always climb cuts, if you make the cut too fast, the teeth will run up on the stock and stall or jam the motor. This can be eliminated by:

Proper drag on the roller-head to counteract the climbing action of the blade.

And/or using a firm arm and hand to hold the motor back from climbing as it is pulled forward.

Sometimes a short, jerky motion (especially while using a dado set) prevents this climbing action.

If you cannot control climbing, and jamming results and if the lumber is not too wide then you can

Draw the saw all the way out.

Place the lumber in position.

Push the saw back.

Remember to hold the lumber down firmly with your left hand for this is a feed cut with the teeth cutting on the way up.

This method has a tendency to lift the lumber and splinter it on its surface. This cut should only be used when you cannot control the climbing action.

Rip cuts are also subject to binding. This can be cured by using a splitter to keep the kerf from closing on the rear of the blade. Many items can be used such as

A splitter vane on the anti-kickback.

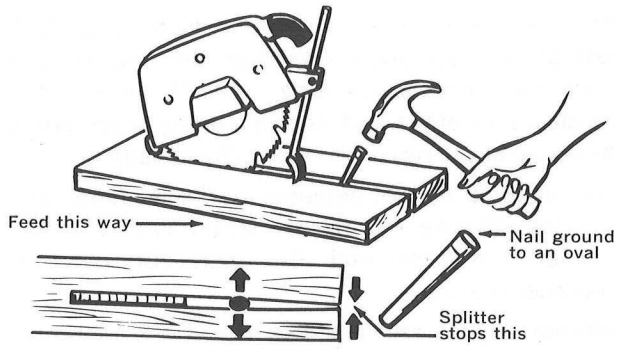
Wedges of wood.

A screw driver placed in the slit, etc.

The best splitter is a steel cut nail ground oval (see illustration).

I would suggest that you hammer this nail splitter about 2 or 3 inches in back of the anti-kickback.

Be sure the saw has been turned off and the blade is not coasting while you hammer in this nail.



Using a nail as a splitter

Figure 16

Another factor that requires more power in ripping is the operator himself.

When you rip a narrow board from 1/16" to 3" it is possible to close the slit by pressing the lumber against the aft or out-feed side. (in an in-rip, the left side of the fence—in an out-rip, the right side of the fence)

By pressing the kerf closed not only do you bind the blade, but you will bring the lumber away from the fence on the fore, or in-feed side by the thickness of the blade.

This will cut a slight taper that can be quite annoying.

This can be prevented with a splitter-nail or better still by not pressing the lumber against the fence on both sides of the blade. Only press on the side you are feeding from.

If the lumber has a tendency to creep away from the fence your saw is out of alignment. The blade has a toe, or the front of the blade is closer to the fence than the rear. This should be corrected before you continue any more ripping. (see Chapter 1 on alignment)

SAFETY TIP In as much as we **Never Climb Cut** when ripping (feed from the anti-kickback end) we do not have the problem of a jam as described in the cross-cut.

The clearance of the kerf.

Except for a dull blade, this is probably the biggest factor that will determine the power necessary to cut a piece of lumber.

Actually a sharp blade has no difficulty in sawing the hardest woods. It is the binding of the blade that requires power.

Therefore, the more clearance a blade has, the easier it will cut. The clearance is generally accomplished in one of three ways:

1. A set.
2. Swedge-carbide tipped blades act like swedged blades.
3. A hollow grind and taper grind will operate in almost the same manner.

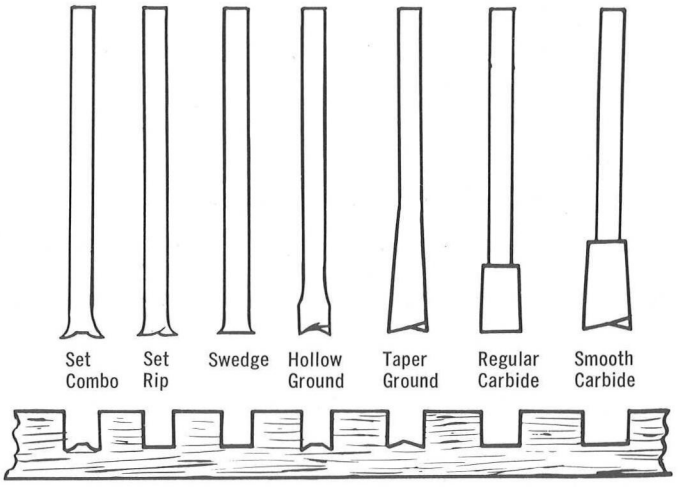


Figure 18

The type of blade you use has a great deal to do with the power required to make the cut. Volumes of books have been written on the different types of saw blades in existence. Here we will discuss only a few that generally apply to radial arm saws.

Wood cutting blades fall into three basic catagories:

Rip Cross-cut Combination

Each of these can have different types of clearance:

Set Hollow Ground Swedge

Each type can also have a different shaped tooth (as shown below):

Basic Rip Basic Cross-Cut Basic Combination

A set blade means:

The ends of the teeth are bent to the right and left so the kerf is wider than the thickness of the blade.

The set of each tooth must be the same.

If too much set is put on all the teeth the cut will be rough. The blade will be noisy and will vibrate and possibly crack.

It takes experience and the right equipment to properly sharpen and set a saw blade.

There are many variations of set type blades. (See following section of this chapter.)

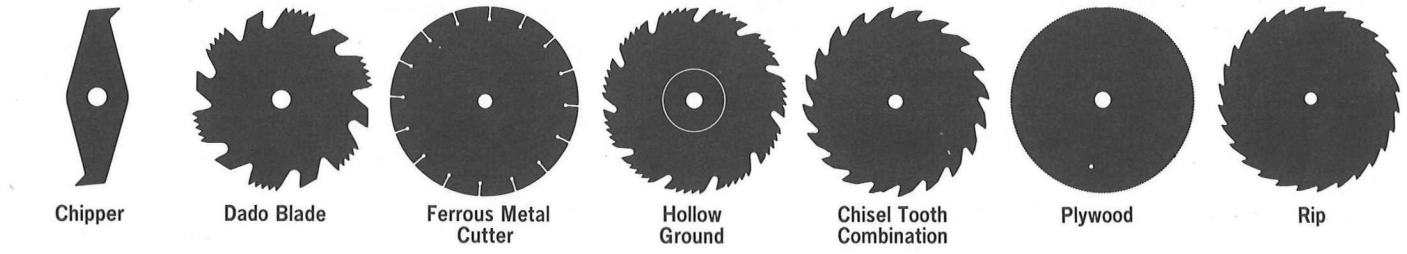


Figure 19

The Swedge Blade.

The ends of the teeth are wider on each side than the steel of the blade.

Most swedge type blades are used to cut soft metals (lead and copper).

The chippers on a dado are swedged.

Another type of swedge is the carbide tipped blade.

Hollow Ground Blades.

This blade gets its clearance because the steel between the teeth and the hub has been ground out leaving the ends of the teeth the original thickness of the blade.

This blade makes a very smooth cut.

Taper Ground Blade.

The clearance is accomplished by grinding the steel in a taper from the tip of the teeth to the hub.

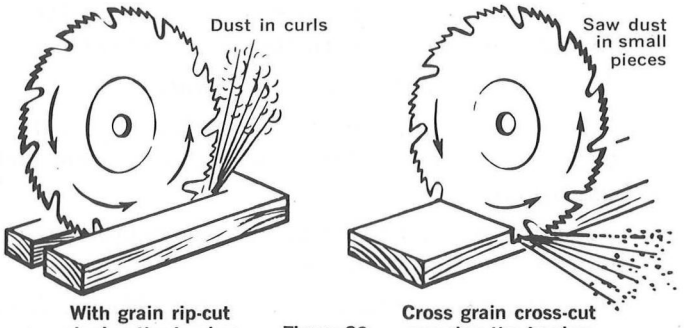
It is used mostly on ply blades for smooth cutting and shallow depth. (Usually 1½" regardless of blade size.)

Rip Blade.

When we rip a piece of lumber (cut it with the grain), we are actually planing out the lumber and each tooth is designed to take along shavings of wood.

The wood is like a bunch of hardwood dowels or straws glued together.

It is not as difficult to sever each grain by cutting across its walls as it is to slice off part of its wall. See Figure 20.



With grain rip-cut planing the lumber

Cross grain cross-cut severing the lumber

Figure 20

The rip blade with its deep gullets and flat bottom teeth is designed to plane out the lumber and throw out the long chips. By the time the chips get banged around in the guard and come out the rubber elbow they no longer are curls but even so, the chip from the rip is quite different from that of the cross-cut. See Figure 20.

Remember it takes more power to plane out the wood fiber than to sever it.

The rip blade should be used when you have a lot of ripping to do, especially on thick, wet or wild lumber.

The rip blade cut is not particularly smooth.

Cross-Cut Blades.

Cross-cut blades are not recommended for use on radial arm saws.

They have a tendency to jam in the cut because the gullets are too small to eject the saw-dust fast enough.

If one is used and jamming is uncontrollable then feed-cut the cross-cuts.

Combination Blades—Set Tooth Flat-Ground.

These blades are the most useful because they will perform each operation equally well.

This blade also saves the operator the time to change from one blade to another.

The combinations have generally 3 types of teeth: 2 cutter, 4 cutter and chisel type.

The 2 cutter type will rip a little easier than the 4 cutter but the cut is not as smooth and it has a tendency to splinter more than the 4 cutter type. It is a good blade for all-around cutting especially for construction work.

The chisel type is generally used in portable saws where the rim speed is quite a bit higher. They are also good for all around construction especially in the 10" size.

Combination Blades—Hollow-Ground No Set.

This blade is about the most popular for those who do cabinet work.

Its cut is so smooth that the work is almost planed—hence it is also called a Planer Blade.

Its cross-cuts and miters are so smooth that it is sometimes called a miter blade.

The problems with this blade are as follows:

Due to the fact that it has no set and its clearance is due to a slight grinding away of the steel, the blade has a tendency to bind in the cut.

It takes 4 to 5 times the power to push a hollow-ground blade through a piece of lumber as compared to a set tooth blade.

To overcome this problem we must first understand what is happening as it is used.

Normally the blade just protrudes through the bottom of the lumber being cut.

Although the stock may be ¾" thick, the blade is actually cutting about 1½" of lumber.

The wide part of the blade at the teeth rubs against the lumber and the binding action is quite strong.

In the rip cuts the blade has to plane out the lumber at the bottom of the cut rather than sever the grain higher up.

All power draining problems can be solved by operating higher up on the blade. The closer to the hub the easier it is to use.

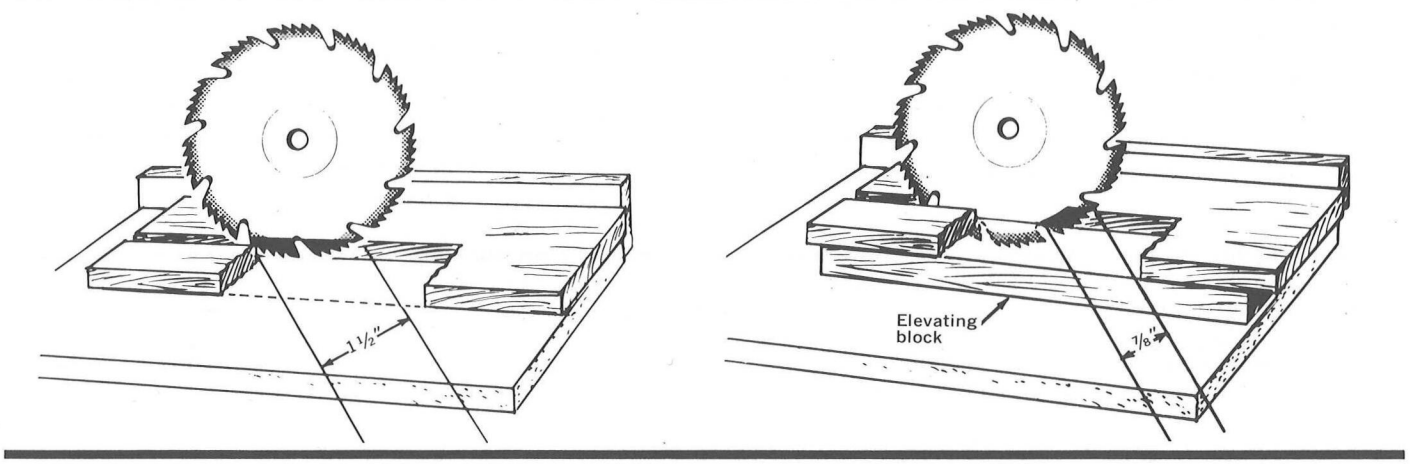


Figure 21

You will find the above method a great help in ripping hard woods.

Cross-cutting usually does not cause much trouble. However, if it does, this type of elevation of the stock will help.

Needless to say, if you elevate the stock to be cut you must use a higher fence in either the rip or cross-cut.

The scrap on each side of the blade should not touch the blade.

The scrap on each side used as elevators should be nailed down and the heads of the nails hit below the surface.

Any protrusion of the nails will mar the stock you are cutting.

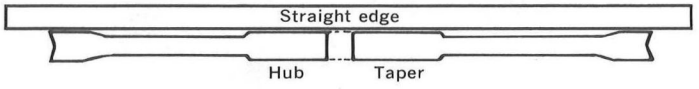


Figure 22

Hollow-ground blades can be sharpened, however, when they get too small (after 8 or 10 sharpenings) they start to lose their taper and will bind all the time.

To check this place a straight edge on the blade. The teeth should come up to the hub or very close to it. See illustration above.

If the taper is gone you do not have to discard the blade. The next time you have it sharpened have it set and it will then perform as a Flat Ground Set Tooth Blade.

Gums and resins that accumulate on the sides of any saw blade will cut down the efficiency and cause burning and dulling at a faster rate. To remove these gums soak the blade in an ammonia and water solution overnight and wipe dry. To keep blades in good condition wrap in waxed paper.

Sometimes freshly sharpened Hollow-Ground blades have burrs on one side. This will leave scratch marks on the lumber. As the blade is used the burrs will wear off and the cut will get smoother. The duller it gets, the more power it requires to cut the lumber. When it gets very dull it will burn the lumber.

The rim speed of the blade.

This has some effect on the power required to cut the lumber.

The faster the rim speed the faster it will cut.

A 9″ blade at 3400 rpm will have a rim speed of about 8000 feet per minute.

A 10″ blade will have a rim speed of about 8900 feet per minute.

More power is required to swing a larger blade.

SAFETY TIP Do not use a larger blade than the machine is designed to take.

Never use a blade if it *does not* fit under the guard.

A smaller blade will require less power to run, but will also cut slower. That is why larger blades use larger motors.

The speed of 3400 rpm is an ideal speed for most sawing and allied operations.

The smoothness of a cut (excluding Hollow-Ground blades) depends primarily on the number of cuts per length. For example,

100 saw teeth marks per inch is ½ as smooth as 200 cuts per inch.

This can be controlled by one of two methods or a combination of the two.

1. The number of teeth on the blade or cutter.
2. The speed at which the stock is being cut (the feet per minute at which it passes the blade or cutter, or the blade or cutter passes it).

This last method is the simplest and most convenient method of controlling the smoothness of cut.

If you rip or cross-cut (or shape) a piece of lumber and have the stock pass the cutter at the rate of one foot in one second you will have ½ the number of

cuts as a piece cut at the rate of one foot in two seconds.

Actually you will get more than twice the number of cuts in ½ the feed time (in the above cut described) because the motor will not slow down as much when it has the same work to do in twice the time.

Therefore, the slower you feed the stock the smoother the cuts.

The only problem presented by too slow a cutting feed is the possibility of the lumber burning. If the stock does not move past the blade fast enough the accumulated heat of the blade may scorch the lumber (particularly if the blade is dull).

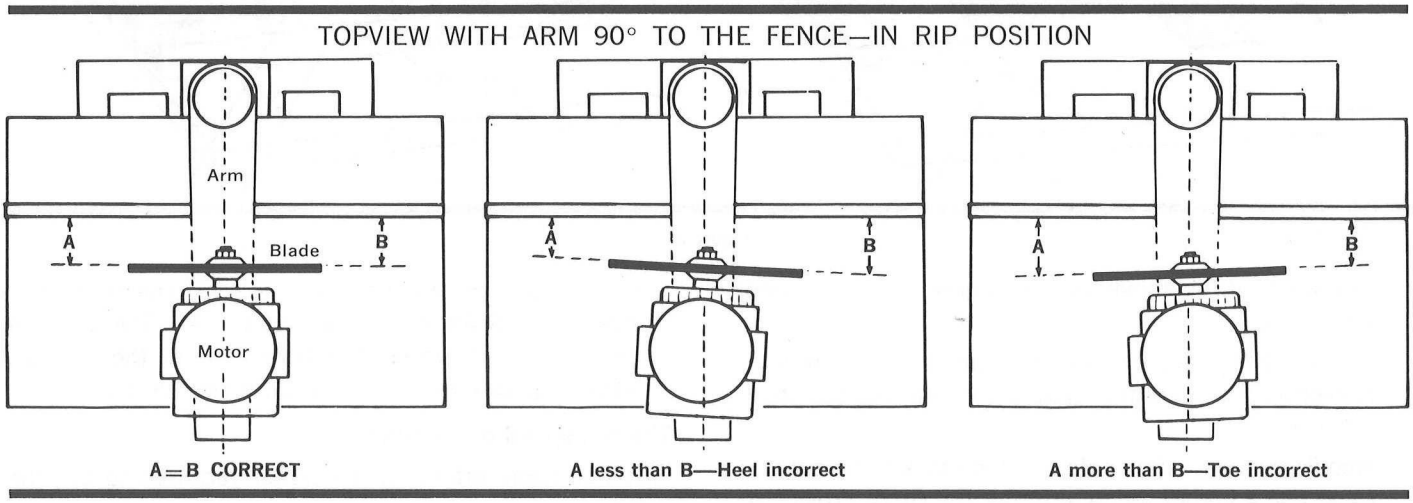


Figure 23

Misalignment (see Chapter 2) is probably the biggest factor in power requirements needed in cutting a piece of lumber.

This factor only shows up when you are ripping (or cross-cutting when the stock is clamped down).

Basically the blade must be parallel to the fence when ripping.

If the rear of the blade is closer to the fence you will have a "heel."

If the front of the blade is closer to the fence you will have a "toe." (See Figure 23, page 18.)

If you have a "heel" the blade has a tendency to cut on a taper away from the fence.

It will try to work its way out on the arm—if you forgot to lock the roller head to the arm it will creep out cutting taper.

If the rip lock is tight (as it should be) the blade will drive the lumber against the fence.

The fence being clamped in place cannot move away and causes the lumber to wedge between the blade and the fence making ripping difficult or impossible.

Even large amounts of power will not overcome this problem if the "heel" is excessive.

If the "heel" is not too excessive and you still have enough power to cut the lumber, you can bend the blade slightly as it revolves. It will bend away from the fence in the rear and you will end up with a tapered piece of lumber. (See Figure 24.) This is an indication of misalignment. This is particularly true of the thin blades that bend easily.

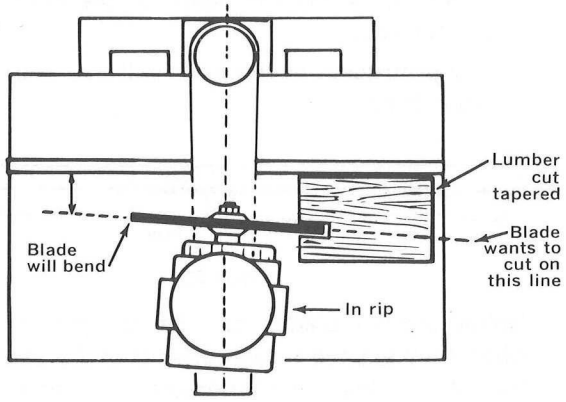


Figure 24

The very thin blades have a tendency to bend quite far out and then start to bend in.

This will cut a curved cut and is called "walking."

Most blades will walk on a misaligned saw.

The stiffer they are the less they will walk.

Thin rim set tooth plywood blades will "walk" in ¾" ply even if the saw is aligned. They are satisfactory on ½" to ⅜" ply only.

Heavy duty taper or hollow-ground ply blades are recommended for most ply cutting.

If you have a "toe" you will have no trouble ripping power wise (no binding).

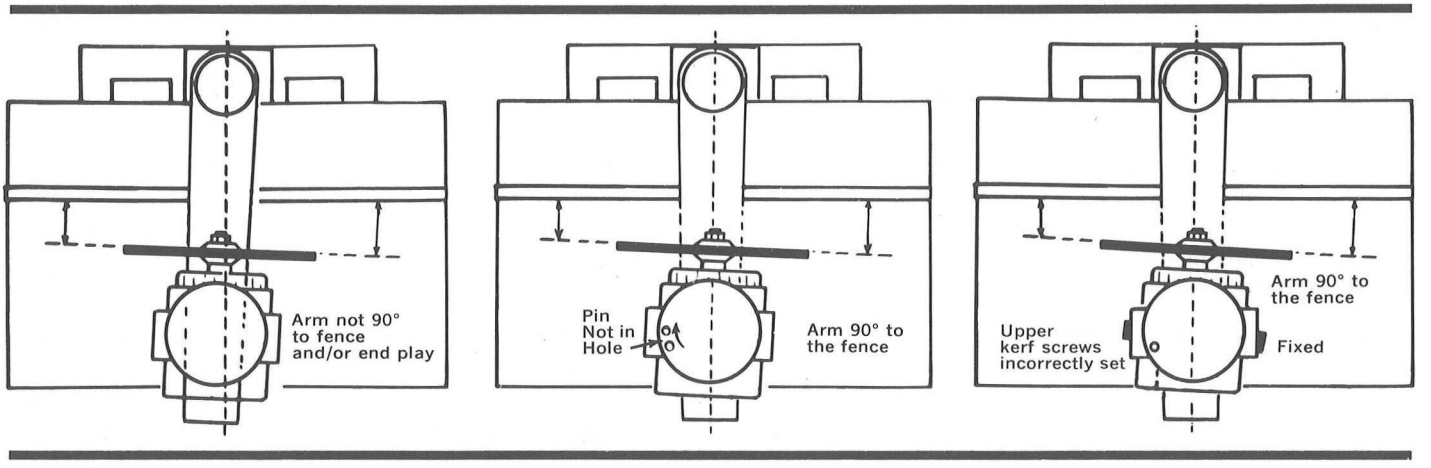


Figure 25

However, you will have difficulty keeping the lumber against the fence.

You will also cut a taper.

If you have a "heel" in the in-rip position your saw will have a "toe" in the out-rip position.

If you have a "toe" in the in-rip position, your saw will have a "heel" in the out-rip position.

The three causes of a "heel or toe" are: (See Figure 25.)

1. The arm not square to the fence or too much end play in the arm.
2. The yoke locator pin being out of place.
3. Kerf screws not properly adjusted.

Note. The binding discussed so far due to a heel refers to all cuts made with the blade 90° to the table.

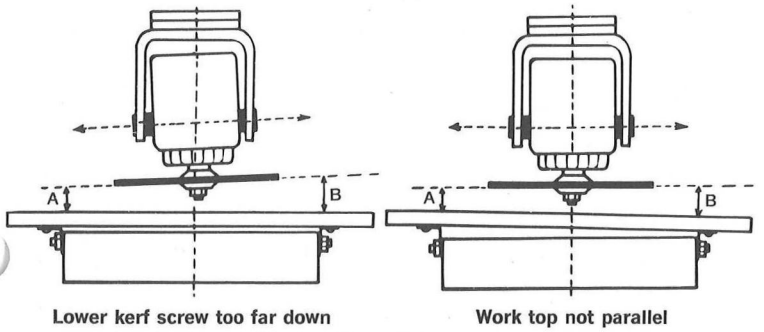
A "heel" or "toe" can also cause trouble when the saw blade is horizontal or at any angle other than 90° to the table.

This is due to either the bottom kerf screws not being properly adjusted as shown in Figure 26.

Or the table not being parallel to the arm as shown in Figure 26.

This may also be caused by a combination of both of these reasons.

Needless to say, a good alignment performed in its proper order is essential to the proper operation of your saw.



Lower kerf screw too far down Work top not parallel

Figure 26

QUALITY OF CUT AND FACTORS INVOLVED.

The wood you are cutting.

Usually the harder the wood, the better the cut.

Some woods (fruit woods) have a tendency to burn easily and give a rough cut.

The greenness of the lumber affects the quality of the cut.

The sharpness of the blade.

Sharp blades are essential for easy cutting. However, freshly sharpened blades sometimes have burrs on them that leave rough cut marks. These usually disappear after cutting 5 to 10 feet of lumber.

Carbide tipped blades hold an edge much longer than regular steel blades (as much as 150 times longer).

The cost of a carbide blade depends on the number of teeth rather than its size. Generally a **good** one costs about $2.00 per tooth.

An 8″ 24 tooth carbide blade may be about $39.00 and a 12″ 8 tooth blade will be about $17.00.

Unless you spend a lot of money for a multi-toothed carbide blade don't expect to get a good quality cut.

For cutting plywood with a smooth cut you need from 3 to 5 teeth per inch on the rim of the blade.

The type of blade you are using is the most important factor in the quality of the cut.

Set teeth combinations and rip blades give rough cuts.

Hollow-ground unset blades give smooth cuts.

Cross-cut or multi-tooth miter blades give smooth cuts.

Hollow-ground cross-cut (ply blades) give very smooth cuts.

Multi-tooth carbides 3 to 5 teeth per inch give smooth cuts.

Lesser tooth cuts per inch is also an important factor with the exception of the hollow-ground blade. As mentioned before this is controlled by the three following factors:

Speed of rotation.

The number of teeth on the blade.

The speed the blade is pulled past the lumber (cross-cut) or the speed the lumber is pushed past the blade (rip cut).

The different blades are used to cut different materials.

Woods (natural)

Woods (artificial): plywood, masonite, novaply, lebonex, celotex, etc.

Metals (non-ferrous): brass, bronze, aluminum, copper, lead, etc.

Metals (ferrous): iron and steel

Ceramics: tile, brick, cinder block, cement, etc.

Stone: marble, granite, onyx, etc.

Plastics: fiber glass, lucite, plexiglass, styrenes, acetates bakelite, formica, etc.

Misc.: paper, cloth, bone, glass, porcelain, etc.

Actually any revolving shaft can be fitted with either a blade that will cut or a grinder that will wear away any material (almost no exceptions).

The chart on page 23 lists the more popular saw blades and cut-off wheels across the top. The left hand column are some of the more popular materials to be cut. At the intersection of any two lines you will find a comment that pertains to that blade and that material.

INTERESTING FACTS ABOUT SOME OTHER BLADES.

The Carbide.

Used primarily because they stay sharp a long time (from 10 to 150 times longer than other blades). Small pieces of carbide are welded to the tips of the blade.

Because the piece of carbide is wider than the steel to which it is welded the blade has clearance in the kerf.

Carbides are used especially for

Cutting large amounts of lumber.

Cutting painted or dirty lumber.

Cutting plywood, masonite, etc. (must have enough teeth).

Cutting aluminum, brass, bronze (with special grind on teeth).

Cutting paper or any abrasive material.

The quality of cut depends on the number of teeth.

The greater the number of teeth the longer they stay sharp.

If you hit a nail with a carbide blade you can lose a tooth or chip one. Keep away from embedded metals. There are special carbide blades that will cut nails.

If a carbide blade has about 1″ or more distance between the teeth with deep gullets and you feed too fast, it is possible for each tooth to cut off large amounts of lumber resulting in excessive splintering and rough cuts. This can be eliminated by using a blade with small gullets and the teeth projecting only 1/64″ past the rim. This rim will hold the lumber back permitting the oncoming tooth to cut off only 1/64″.

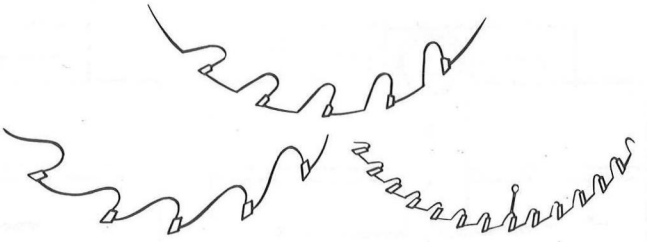


Figure 27

When this type carbide is sharpened the teeth get shorter and the rim must be ground back so the teeth protrude 1/64th of an inch. (This is important and difficult and should only be done by professionals.)

Cheap carbide blades are worthless and dangerous. Sometimes the teeth fly off.

SAFETY TIP **Never** use a carbide blade, or any other blade, without the guard on the saw.

Note. Do not mistake the carbide blade with the hard-tip blade which looks like a carbide, or the T.C. (tungsten carbide) wheel that does not even look like a saw blade.

The Tungsten Carbide Wheel.

This is comparatively new on the market and is very popular in many forms of abrasive.

Sharp pieces of tungsten carbide (like small pieces of broken glass) are chemically adhered to a disc of steel.

Grits generally run in 4 different sizes: fine, medium, coarse and very coarse.

With the grit on the edge of the wheel as well as on the sides, the wheel acts like a thin sander.

The lumber is severed because of the sanding action rather than a chiseling action as with the saw blade.

The action is slower and the cut is wider and the sawdust is in powder form.

In ripping you have no clearance, but any binding is eliminated because as the lumber presses on the side of the wheel the abrasive on the side cuts it away.

They don't burn or bind but they sometimes cut a curved cut.

The dust (as in a sander) **is explosive** at about 70% wood 30% air combination.

This wheel will work on some plastics—plexiglass and lucite.

Green lumber will present the problem of clogging with this wheel. The gums and resins accumulate quickly and must be removed with a toothbrush and solvent quite often.

Some wheels are abrasive on most of the two sides and they can be used as sanders. You can not use this as a surface sander because the arbor and nut will be in the way.

It does not matter how the wheel is mounted on the arbor as it will cut in any direction.

The Hard Tip Blade.

This blade looks like a carbide blade because the teeth are black.

Actually this blade is of a softer steel and each tooth has been heat treated. This makes them quite hard and brittle.

This blade can be sharpened on a grind stone but cannot be set.

You can get from 4 to 7 sharpenings on each blade and then they must be discarded.

They are reasonable in price and hold the cutting edge 4 to 5 times longer than ordinary blades.

They are also made with a hollow grind.

The Friction Wheel.

This wheel is quite new on the market and is used to cut iron and steel only.

It is used to heat the metal you wish to cut to a point that it starts to melt. The blade is first brought into contact with the iron or steel and the rim of the blade rubs on the metal to be cut. After a moment or two sparks start to fly and you can feel the iron or steel start to soften under the wheel. At this point it will cut quite fast.

This wheel has a tendency to leave a large burr.

The wheel will never get dull. It is always used dry.

SAFETY TIP Be careful of the sparks and molten metal. This can start a fire in accumulated sawdust. Safety glasses should be worn.

These wheels come in several shapes. Pictured below is the most common shape.

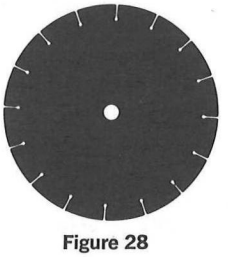


Figure 28

The Cut-Off Wheels.

These are very popular and will cut almost anything except wood.

They will cut all metals, all pastics, all stones and ceramics.

They come in two basic forms.

Glue and/or rubber-based binder holding an abrasive.

Plastic and/or fabric binder holding an abrasive.

SAFETY TIP The first form is faster but dangerous as it can crack and fly apart. The second form is slower, flexible and safer.

SAFETY TIP When using any cut-off wheel or grinder **be sure to wear shatter proof safety glasses.**

These wheels come in many types of abrasive, however, any one abrasive will do all types of cutting. For instance, if you have a wheel for cutting steel it will also cut slate. It will just not cut as fast as the one especially designed for cutting slate and visa versa.

Cut-off wheels do not get dull but they do wear away. Therefore, always get one as large as the guard on your saw will hold.

To prolong life of a cut-off wheel keep it cool as follows:

A mist spray of water directed at the point of contact (a stream of water will splash into the motor and destroy it).

Wetting the material you are cutting. (This is easy when cutting ceramics and stone.)

SAFETY TIP **Danger.** Some plastics (nitrose acetates are flammable with little heat—check flash point on such material and get the recommended blade. **Do not smoke.**

Plastics (fiber glass, bakelite) that get hard under heat work well with the cut-off wheel.

SAFETY TIP Some people are allergic to the dust of some plastics, especially fiber glass. **Wear a mask and eye shields** while cutting any plastic, stone, ceramic or metal.

Other Blades.

Numerous books have been written about blades. The few mentioned here are the most common ones used on radial arm saws.

However, you can use blades to do the folowing:

Cut dove-tails.

Cut curves.

Cut in either direction.

Cut thin splines.

Cut nails, styrofoam and oiled fiber glass.

Cut veneers.

For any specialized cutting always contact blade specialists or blade manufacturers.

Blade Sharpening.

For good results the blades you use must be sharp. A sharp blade cuts faster, easier, cleaner and is safer.

A blade must also be in perfect round. If it is not it will vibrate and some of the teeth will be doing more cutting than others (this is usually indicated by a few of the longer teeth turning black from overheating.

A blade must be flat (not dished like a bowl). Some blades are warped slightly. If the blade is tensioned (hammered to relieve its internal stresses) it will straighten out at its designed running speed.

A blade must have the right hook and rake on its teeth. To determine this:

Draw a line from the tip of the tooth to the center of the blade.

Project a line toward the center from the tip, parallel to the cutting edge.

This line should be about 15° in back of the line to the center.

If the two coincide you have 0° rake.

If the line is in front of the center line you have negative rake. (See Figure 29.)

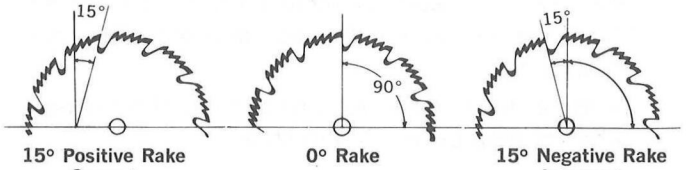


Figure 29

0° or negative rake are the main reasons for some blades cracking.

SAFETY TIP If you have a cracked blade it is an indication that it has been improperly sharpened. A cracked blade can be dangerous and should be discarded.

A blade must have its proper clearance. This is accomplished in one of 3 ways or a combination of two. (See page 13 Saw Blades.)

A set.

A hollow-grind.

A swedge.

Some blades must be gummed—cleaning out the gullets so the blade can eject the chips.

This is especially true of rip and combination blades.

All blades must be clean and free from resins that accumulate on the sides of the blades.

Soak the blades in hot water and ammonia for a few hours.

Wipe dry and wrap in waxed paper.

Or oil slightly.

Have your blades sharpened professionally if you are not capable of:

Cleaning the blade.

Jointing—putting it in perfect round.

Sharpening with the proper rake.

Gumming the blade with a special file or stone.

Setting the teeth uniformly (except hollow-ground).

If you are determined to sharpen your blade yourself or cannot get them sharpened professionally, here are some hints to follow:

Jointing.

Put the grinding stone on the arbor (some instructions say to put the blade on the arbor and lower the revolving blade by hand until it touches a flat stone **—This is dangerous).**

With the grinder revolving and the blade horizontal, elevated on a block and pivoted on a center, turn the blade by hand and let each tooth pass the edge of the grinding stone. (See Figure 30.)

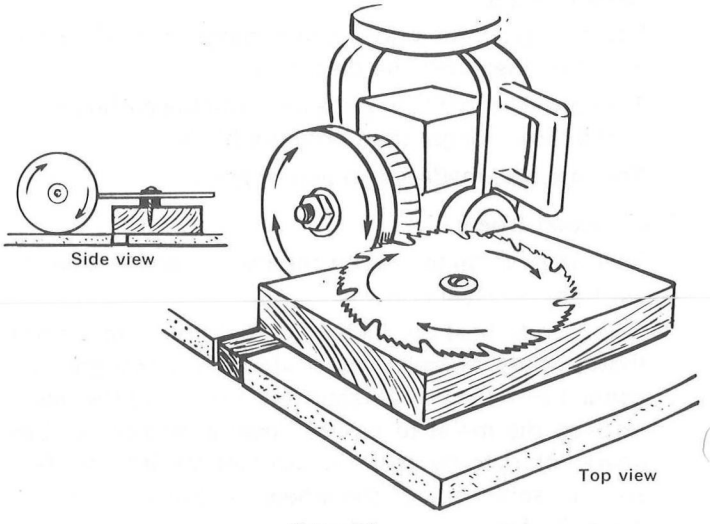


Figure 30

Sharpening.

Most blades are sharpened with a triangular shaped file at a compound angle with every other tooth at the same angle. (Each manufacturer varies slightly, so follow the original angles as best you can.)

Hollow-ground blades can be cleaned of the burrs with a small stone or a small hard scraper.

Hard tipped blades must be sharpened with a grinding wheel.

Setting.

This must be done on an anvil so each tooth has exactly the same and proper amount of set.

Too much set or uneven set will cause a rough cut, dull the blade fast, vibrate and even crack the blade.

Some small tooth blades can be set with a hand setter.

Hollow-ground blades are never set (there are exceptions to this).

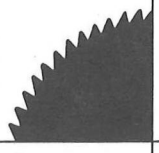
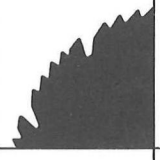
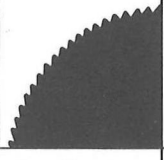
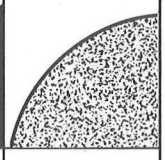
Hard tipped blades can't be reset (the teeth break off).

Gumming—cleaning out deep gullets.

Can be done on a grinder or with a file.

At the same time as a blade is gummed, the raker tooth is cut back about 1/64" lower than the cutting teeth on novelty tooth combination blades. If they are not shorter they will do all the cutting and will burn up.

SAW BLADE REFERENCE CHART

	COMBINATION SET TOOTH	RIP	CROSS CUT PLY	HOLLOW-GROUND PLANER	CARBIDE 8-12 TEETH	CARBIDE MULTI-TOOTH	TOOL STEEL H.G. CROSS-CUT	CUT-OFF WHEEL
								
Wood—Natural	Fast Rough	Fast Rough	Slower Smooth Can't Rip	Slower Very Smooth	Fast Rough	Fast Smooth	Smooth Slow Cross-Cut Won't Rip	Will Not Cut
Wood—Artificial (Plywood) Masonite Novaply, etc.	Fast Rough Dulls Blade Quickly	Fast Splinters Dulls Fast	Slower Smooth Dulls Slowly	Fast Smooth Dulls Instantly	Fast Splinters Stays Sharp	Fast Smooth Stays Sharp Best	Fast Smooth Holds Edge Quite Long	Will Not Cut
Metals—Non-Ferrous Alum. Copper, etc.	O.K. On Soft Aluminum Dulls	Will Destroy Blade	Better O.K. on Aluminum Brass, Copper	Will Destroy Blade	Will Pull Out Teeth If Cut Too Fast	Very Good If Used Slowly	Very Good If Used w/Tallow or Spray	Slow Used With Spray
Metals—Ferrous Iron and Steel	Will Not Cut	Will Not Cut	Will Burn Through After Teeth Are Dull	Will Not Cut	Will Destroy Blade	Will Destroy Blade	Will Burn Through	Will Cut Slowly Use Coolant
Plastics—Soft	Will Chip	Will Shatter	Better May Melt Material Use Spray	Will Not Cut	Will Chip	Very Good	Good But May Bind or Melt Material	Slow May Clog, Bind and Melt Material
Plastics—Hard	Will Chip and Dull Fast	Will Shatter	Cuts Well Dulls Fast	Will Bind	Will Chip	Very Good Smooth	Good Smooth	Good Slow Use Lube
Paper Cardboard	Will Dull Very Fast	Will Tear and Dull Blade	Good Will Dull Very Fast	Will Bind and Dull Blade	Rough Cut Use Slowly	Good Will Dull Very Fast	Good Sometimes Binds	Will Burn
Bone Ivory etc.	Will Shatter	Will Shatter	Good Cut Slowly	Good Will Dull Fast	Will Shatter	Good	Good	Some Are Good Must Try

Chapter 4
Making Your First and Basic Cuts

CROSS-CUT

The most important and frequently used cuts are the simplest. We will start with these.

To cut a board 90° to the fence and (90°) to the table:

Locate the arm 90° to the fence and the blade 90° to the table.

Place the stock against the fence and move it to the right or left until the saw blade will cut it at the desired spot.

Be sure that the blade is engaged into the plywood table about 1/32".

Hold the lumber with your left hand, the four fingers on the surface of the wood and the thumb tucked under the palm. (See Figure 31.)

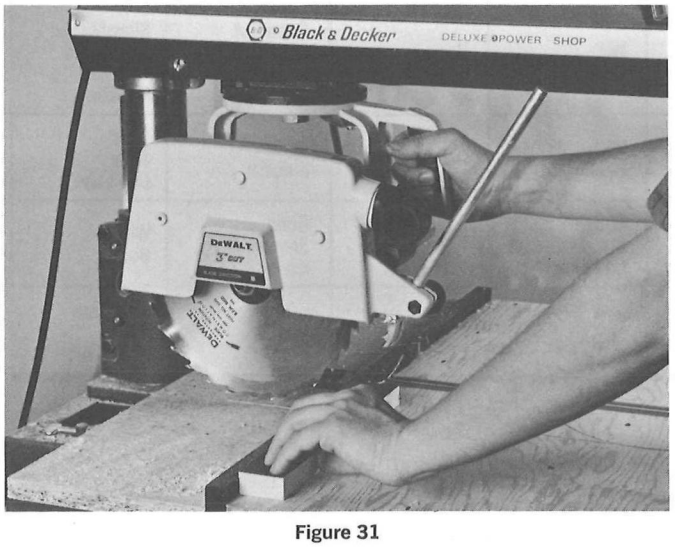


Figure 31

With the four fingers of the left hand on the surface of the wood to be cut and the thumb tucked under the palm pull the saw forward to make the cut.

Turn the saw on and, while the blade is revolving, draw the yoke forward with your right hand.

Continue to cut the lumber drawing the saw forward just far enough to sever the lumber.

Once it has been severed do not pull the saw forward any more. Instead, push the saw all the way back. The reason for this is as follows:

If you draw the saw far enough forward so the rear of the blade comes out of the cut it is possible that one of the pieces from the cut will move in back of the blade.

Then as you push the saw back the teeth will recut the lumber.

This will probably happen to the right hand piece you have just cut off and not to the piece you are holding with your left hand.

SAFE

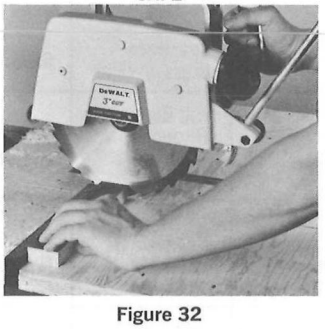


Figure 32

Pull the saw forward just far enough to sever the lumber.

UNSAFE

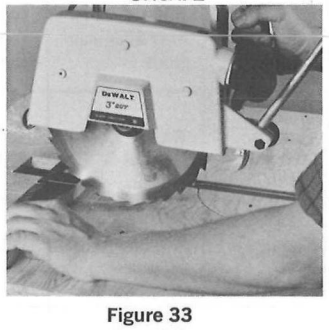


Figure 33

This is dangerous. The blade has been pulled too far out beyond the piece being cut. When it is returned it can pick up the right hand piece and throw it over the fence.

If this should happen the teeth will hit the right hand piece of lumber and lift it over the fence with quite a bang.

However, if the blade is left in the cut (as is in the correct procedure) neither of the two pieces can get in back of the blade because the blade itself will be in the way.

Therefore, to make this cut correctly:

Start the cut with the blade in back of the fence.

As you draw the saw forward, the rotation of the blade will bring the cutting teeth down on the stock as they chisel their way through the stock.

As the teeth engage the lumber they actually push the lumber down and back against the fence.

Since the lumber cannot move down or back you can literally cut it without holding it.

You can take advantage of this when cutting small pieces of lumber.

It will not be necessary to solidly clamp or grip a small piece of lumber when cutting it.

A small piece of stock can be held in place with a small piece of scrap wood held with a fairly light touch.

You do not have to use your left hand as a vise to grip the stock against the fence.

SAFETY TIP It is not safe to put your fingers on the back side of the fence.

The action of the teeth cutting into the lumber causes the blade to climb or run over the stock.

Hence, this type of cut is called a "climb" cut.

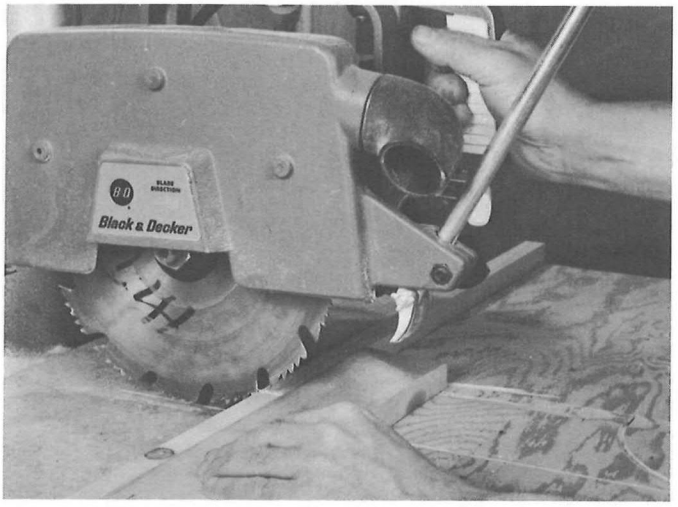


Figure 34

Climb cut—as you pull the saw forward the tendency is for the saw to climb towards you. This climbing action holds the lumber down and back. Proper roller head adjustment is necessary to control excessive climbing. See text.

If you pull the saw forward faster than the blade can cut the lumber it will climb up on the stock and jam.

If you climb up on the lumber too often too quickly you can knock the bevel setting off square. (See Chapter 1 on Alignment.)

A proper fit of the roller-head will eliminate a great deal of this climbing effect. (Check your saw for the proper drag as described in Chapter 1.)

You can also stop the climb effect by using a firm hand and drawing the saw forward at a steady rate giving the blade enough time to cut the lumber.

If, in spite of the proper drag of the roller head and a stiff arm, you find you cannot stop the saw from climbing you can then resort to a feed cut. (This constant climbing usually occurs where you are cutting wide, deep dado cuts or in saw cuts through very hard wood.)

To make the feed cut proceed as follows:

Draw the saw all the way out.

Lay the stock on the table against the fence in the desired position.

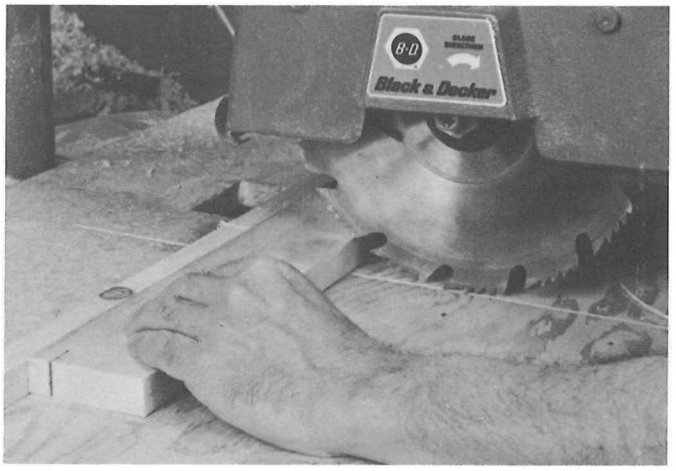


Figure 35

Feed cut—if you start the cut with the blade in the position shown and push the saw back, the action of the blade has a tendency to lift the lumber and splinter the top surface. This manner of cutting is NOT recommended and is only used for rare operation. See text for further explanations.

Turn the saw on and cut the stock by pushing saw all the way back.

This is called a "feed" cut because the teeth of the blade are coming into the lumber from the bottom, as you push the saw back, and they are pushing the lumber up.

The blade will have a tendency to run out of the stock toward you, therefore, if you stop pushing, the blade will stop cutting.

In other words, you must constantly feed the blade into the lumber in order to cut it.

SAFETY TIP Because the teeth are cutting on the up stroke so you must hold the lumber down with your left hand or the blade will lift it over the fence and throw it back.

SAFETY TIP **Only** use this "feed" cut if you can not control the "climb" cut.

If you are cutting a veneered plywood climb cut it with the good side up. Feed cut it with the good side down.

How to make the cross-cut on wider lumber.

The cross-cut capacity of the average saw is 13" with the fence in its forward position.

If you have a piece of plywood 15" or 16" you can cut the two or three extra inches of it by lifting the wood up against the motor bottom while the motor is out at the end of the track.

In order to cross-cut 24", the fence has to be moved all the way to the rear. (A few problems will come up in this cut that will be discussed at the end of the chapter pertaining to the cutting of plywood.)

The 45° miter cut (the second basic cut).

Return the saw to its original or basic position. (Arm 90° to the fence blade 90° to the table and the roller head all the way back.)

Have the blade 1/32" below the surface of the ply (as before). It should be almost 1/4" above the backboard. (This is one reason we have not covered this backboard with ply.)

Release the miter lock lever. The arm can now be moved to the right or left without the blade scraping the table.

Move the arm to the right. When the saw reaches 45° the locating lever will fall into a groove on the post.

Lock the arm by pushing the miter lock lever.

Place the stock on the table and against the fence.

Hold the stock with your left hand and pull the saw forward with your right hand.

Draw the saw forward just enough to sever the lumber and then push it all the way back. (See Figure 36.)

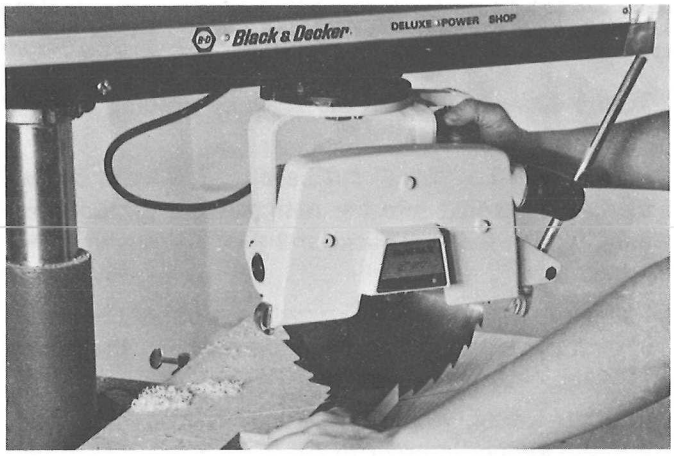


Figure 36

45° right hand miter. Saw drawn out just far enough to sever the lumber.

If you are going to cut miters at any other angle other than 45°:

Select the angle on the scale and lock the arm.

You will make a new mark in the fence and ply top when you make the cut.

If you do not want to score the top too much, place a piece of scrap on the top and engage the blade in the scrap.

The 45° bevel cut (the third basic cut).

Return the saw to the 90° cross-cut position.

Draw the saw forward until the blade is about 3 or 4 inches in front of the fence.

Elevate the saw 18 or 19 turns.

Hold the anti-kickback rod (upper end) with your left hand and release the bevel lock and locator with your right hand. Rotate the saw counterclockwise.

Release the locator pin and the saw will fall into place at a perfect 45°.

Lock the bevel lock with your right hand.

Lower the arm with the crank handle until the blade is in its groove (about 1/16" below the surface of the table).

Turn the saw on and push it all the way back.

To make the cut:

Hold the lumber with your **right hand** and pull the saw forward with your **left hand.**

Pull the saw until the bottom of the blade is about 1/2" past the lumber you are cutting.

If you hold the lumber in your left hand and pull the saw with your right hand you will be left with a small protrusion of lumber on the right hand piece. This will also happen if you just pull the saw forward stopping when the lumber has been severed. This protrusion must be sanded off or cut off with a knife. However, this protrusion will only appear if you hold the lumber with your left hand and the right hand piece is small or not against a stop.

INCORRECT

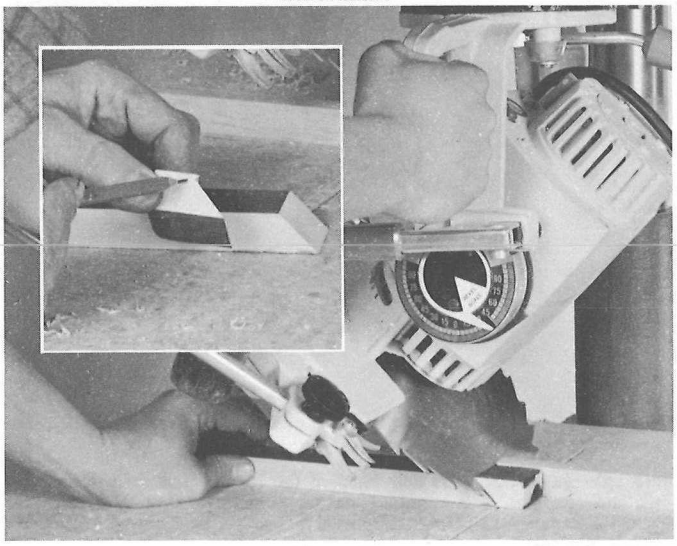


Figure 37

Right hand piece moves away from saw blade before it has completely been cut leaving small protrusion.

If you hold the lumber with your left hand and pull the saw with your right hand, the right hand piece will be left with a small protrusion at the end of the cut. Note: hand is not visible to operator.

CORRECT

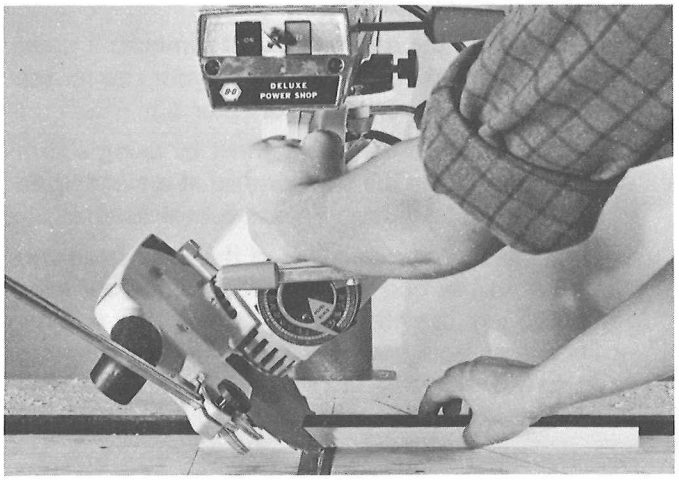


Figure 38

Hold the lumber with the right hand. Pull the saw forward with the left hand far enough to completely cut the right hand piece. Note: hand is visible to operator.

The compound cross-cut:

Elevate the arm about 19 or 20 turns (if the bevel angle is small you need fewer turns).

Pull the saw forward so the blade is about 6″ in front of the fence.

Tilt the blade to the desired bevel angle and lock the bevel lock.

Move the arm to the desired miter angle and lock the miter lock.

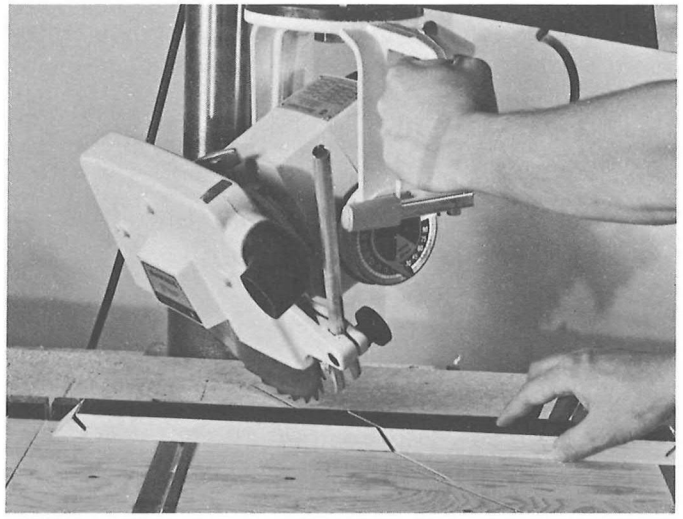


Figure 39

Compound cut—arm mitered at 35°, bevel at 30°. This is a common combination for shadow box picture frames.

Turn the saw on and lower the arm until the blade just strikes the table.

Push the saw all the way back cutting through the fence as you do so.

Lower the arm about ½ turn.

Pull the saw forward recutting the fence and the ply top. (Be sure there are no nails in the line of cut.)

If you do not want to cut your ply top place a piece of scrap on the table and proceed as just described. Engage the blade into the scrap.

The cuts just described are the basic cross-cuts. However, there is one more cross-cut with the saw blade horizontal to the table. In this position the lumber must be elevated 2″ so the guard can pass over the table top. This cut is rarely used to sever a piece of lumber. It is used more to groove, rabbet or shape the end of a piece of lumber. This will be discussed more in chapter titled Joints.

The rip cut.

With your kerf cuts properly cut into table top (see page 10) you can easily convert from a cross-cut to a rip, using the following steps:

With the blade 90° to the fence and 90° to the table, engage the blade 1/32″ into the table.

Pull the saw forward with your **Left Hand** to the end of the track.

With your right hand release the yoke lock and yoke locator pin.

Swing the roller head to the out-rip or in-rip position with your left hand. The pin will fall into place when the blade is parallel to the fence. The blade will go through the swing line you cut in the ply top.

Lock the yoke lock with your right hand.

Push the saw to the desired rip width.

Lock on the track by tightening the rip-lock clamp.

By using this method you will not have to raise or lower the arm, also you will force the track to wear evenly over its entire length.

The rip scale can be set for in-rips or out-rips to compensate for blade change.

Things to know about ripping:

Never rip without the guard set properly. (See Page 29.)

Ripping takes 4 to 5 times more power than cross-cutting.

The chip is planed out and rip blades are better designed to do this operation.

Binding of the blade causes more burning. (See chapter on Saw Blades.)

The desired piece of lumber is best cut between the blade and the fence.

The other piece of lumber is called the fall-off.

The desired piece should never be left between the revolving blade and the fence.

When ripping narrow widths do not push the lumber against the fence on both sides of the blade.

This will close the slit binding the blade.

This will also bend the lumber and pull it away from the fence on the in-feed side causing a taper rip. (See Figure 40.)

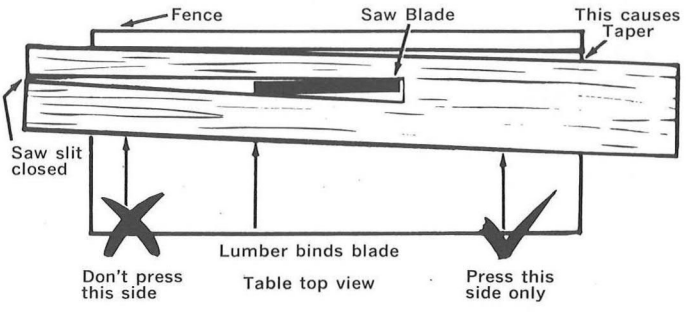


Figure 40

If the saw is in good alignment you can rip as thin as 1/16″ between the blade and the fence.

Thinner than that, the thin piece should be the fall-off piece.

Rips are always feed cuts and the blade has a tendency to lift the lumber. Therefore, you must hold it down as you push it past the blade.

On thin stock, because it is flexible, you cannot hold it down under the guard by hand. You must hold it down with wood springs or by straddling the blade with a piece of scrap.

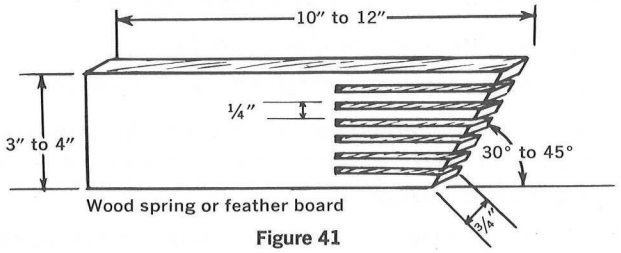


Figure 41

Two or more can be used to hold the lumber down or against the fence. (See Figure 42 and Figure 43.)

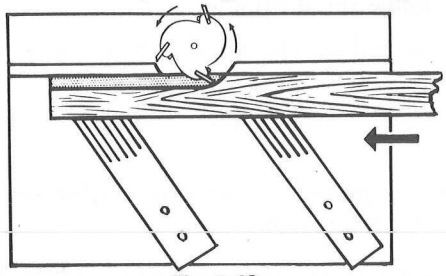


Figure 42

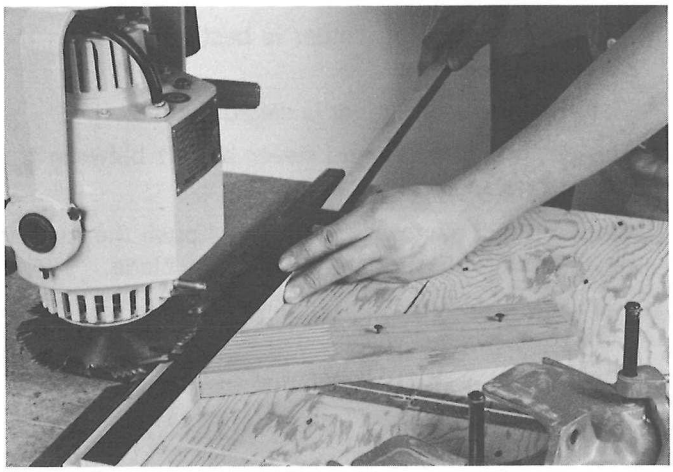
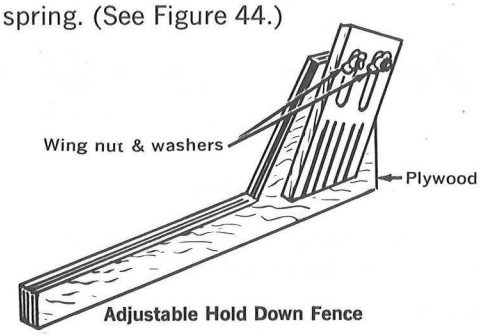


Figure 43

This photo is to show the use of the feather board. It holds the lumber against the fence for ripping, shaping or dadoing. Guard has been removed for photographic reasons only and should be used for this cut.

You can also use an adjustable hold down fence and wood spring. (See Figure 44.)



Adjustable Hold Down Fence

Figure 44

SAFETY TIP Never reach around and pull out a rip-cut or rip without the anti-kickback set. Use a face shield or safety glasses for eye protection.

Keep your blade sharp and free from gums and resins.

To rip long boards you must have extensions, a roller table or someone to help you.

Ripping generally means sawing a piece of wood with the grain. Sometimes it means sawing a piece of wood in its longest dimension regardless of its grain.

If you wish, you can rip a short piece of lumber in the cross-cut position and you can also cross-cut a wide piece of lumber in the rip position.

Ripping has two positions of the yoke, In-Rip and Out-Rip.

In-Rip (or right hand rip) where the blade is between the motor and the post. (See Figure 45.)

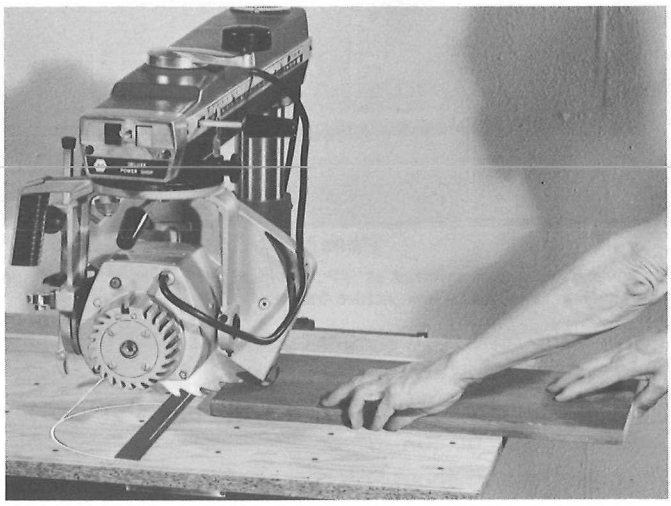


Figure 45

We feed the lumber from right to left. The teeth of the blade come up from the bottom and have a tendency to lift the lumber as well as to push it out of the blade to your right.

We must continue to push the lumber into the blade, hence, it is a **feed cut.**

SAFETY TIP If the lumber was fed from left to right, with the saw in the "in-rip" position, the teeth of the blade would climb down and over the lumber and pull it out of your hands. **This is dangerous and should never be done.** Read warning on the guard itself.

SAFETY TIP If the anti-kickback is set properly it will prevent the lumber from being fed from the wrong direction. (See Setting the Guard below.)

The in-rip is used with the fence in its normal position for rips from 1/16" up to 7½".

You can use the in-rip for wider rips by moving the fence back but you may find it easier to convert to the out-rip position instead.

Out-Rip (or left hand rip) where the motor is between the post and the blade. (See Figure 46.)

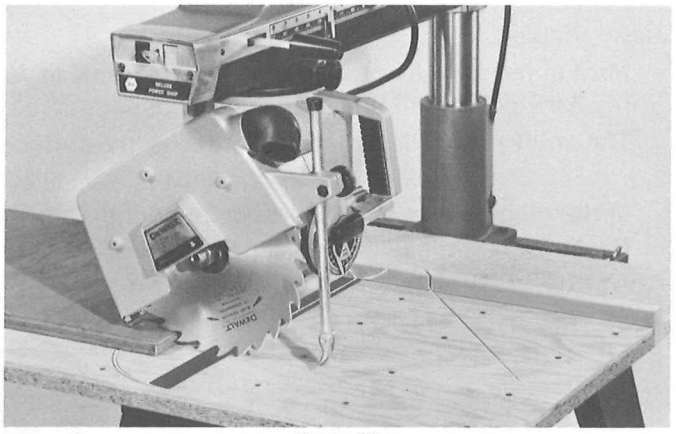


Figure 46

With the saw in the out-rip position, feed the lumber from left to right.

The maximum width on the out-rip position, with the fence all the way back is slightly over 24".

Industrial machines go as wide as 44".

Setting the Guard.

SAFETY TIP With the motor not running and the saw in either position proceed as follows:

Place the lumber, to be cut, alongside the blade.

Lower the front of the guard until it is just about 1/8" above the lumber.

Lower the anti-kickback until it is about 1/8" below the surface of the lumber. This will prevent the lumber from kicking back and prevent you from feeding in from the wrong end. To check for proper adjustment slide the piece to be cut under the fingers of the anti-kickback. Pull back on piece. If fingers do not grab, readjust. On prefinished and other very smooth surfaces the anti-kickback might have to be raised slightly for proper grab.

Aim the rubber elbow to deflect the sawdust where you desire. If you have a shop vac you can attach it to the rubber elbow.

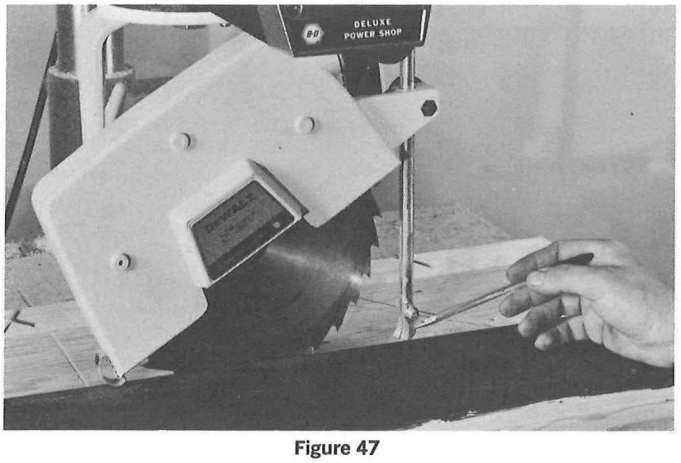


Figure 47

The guard is set the same way for in or out-rip positions. The front of the guard 1/8" above the surface, the anti-kickback 1/8" below the surface.

Pushing the Lumber (In-Rip).

Always eject the piece of lumber from between the blade and the fence.

If you have enough room (3½" or more) you can push it out by hand. You must remember to:

Use your left hand as a guide only to keep the lumber down and against the fence. Use your right hand to push with on the end (with your thumb tucked under the palm of your hand) and the other four fingers on the surface of the lumber.

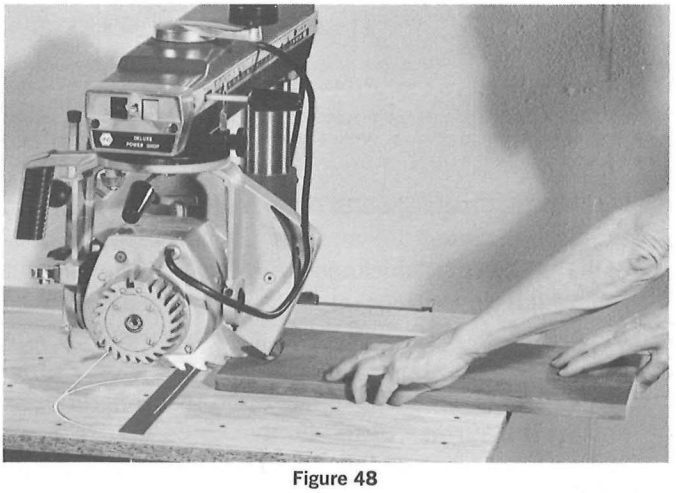


Figure 48

The left hand is used to hold the lumber down and against the fence. The right hand pushes the lumber. Notice the thumb of the right hand tucked under the palm of the hand.

After the lumber has been pushed past the anti-kickback remove your right hand **in a circular motion to the right.**

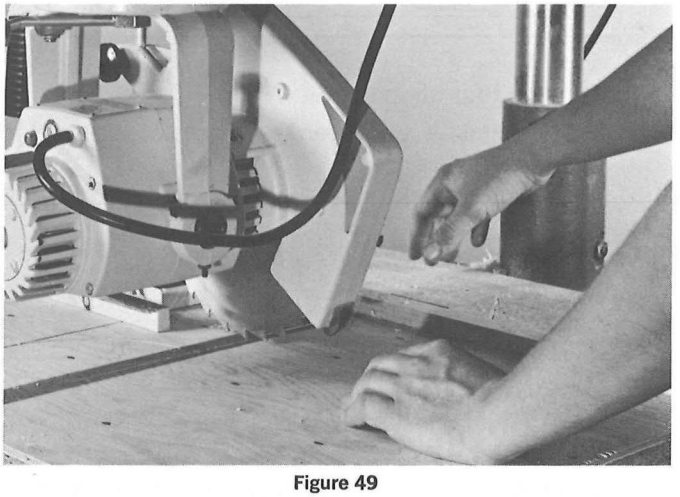


Figure 49

With enough room between the blade and the fence you can push the lumber past the blade with your right hand. Remove your hand in a circular motion to the right as shown.

SAFETY TIP If you have less than 3" but more than ¾" between the guard and the fence, if you wish you can use a top side push stick. (Any piece of wood but preferably one shaped as in Figure 50.)

Figure 50

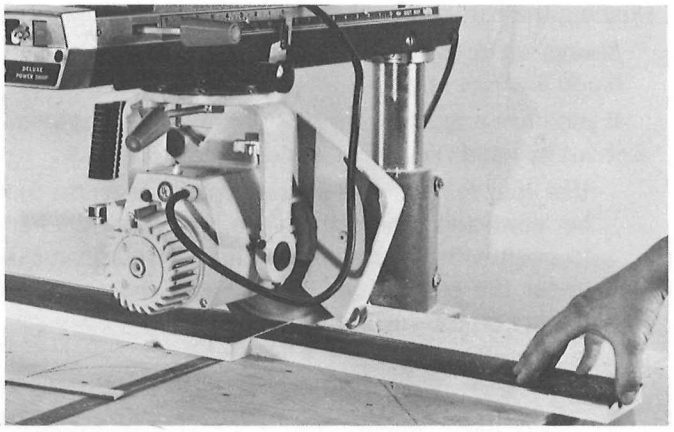


Figure 51

If you do not have enough room to push the lumber out with your hand, use a pusher stick as shown. Notice thin strips being ripped with this method.

If you do not have enough room to use a top-side pusher stick you must use an edge pusher stick. (A piece of scrap the same thickness as that which you are cutting which you will cut into with the blade as you push the lumber past the anti-kickback.) If you wish to hold the lumber down with an edge pusher, cut a small rabbet on the end of the pusher and rest this rabbeted end on the surface of the lumber to be cut. (Be sure to keep the front of the guard a little higher so the pusher will go under it.) (See Figure 52.)

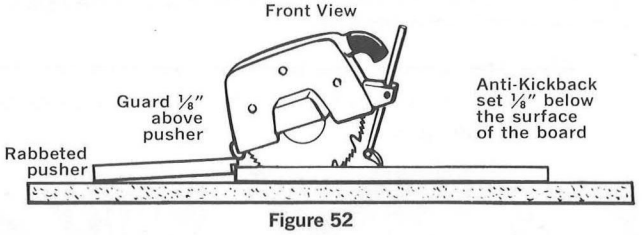


Figure 52

To rip very thin lumber.

Either laminate it between two pieces of scrap. (See Figure 53.)

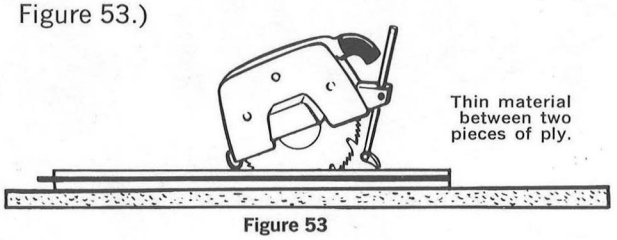


Figure 53

Or straddle the blade with a piece of scrap that has been slit at the width you wish to rip. Clamp this against the fence with just a little clearance. (Enough clearance for the thin stock to pass under it.) (See Figure 54.)

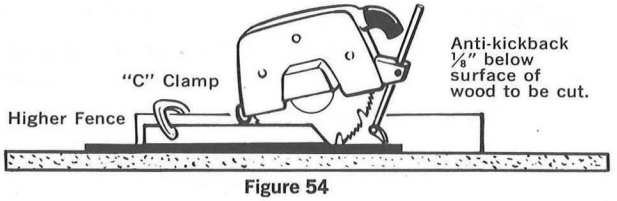


Figure 54

Have a second piece of lumber, the same thickness as the first, to push out your final cut. **Do not pull the pieces out from the rear.**

Bevel Ripping.

Most of the rules for bevel ripping are the same as for regular ripping with the following exceptions.

The anti-kickback is set about ½" below the surface.

Only 50% of the sawdust is ejected out of the rubber elbow and the rest comes out the side of the guard and can get into the operator's eyes. Therefore, you should use a **face shield or safety glasses.**

An edge type pusher stick is almost always needed.

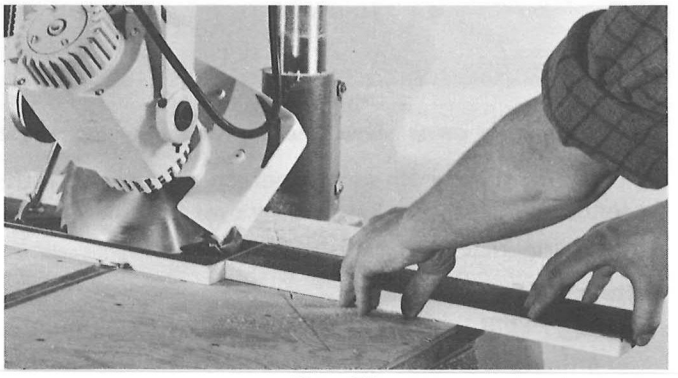


Figure 55

Almost all bevel ripping must be pushed out with a pusher stick.

Taper Ripping.

A short taper rip can be cut in the cross-cut.

Long tapers can be ripped in the in-rip and out-rip position with a taper stick or taper jig. (See Figure 56.)

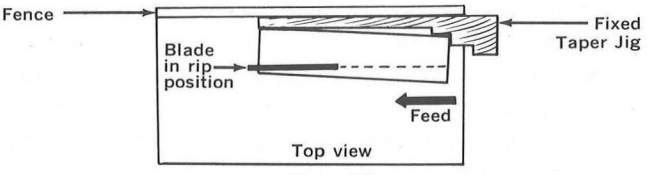


Figure 56

Still longer rips can be made by attaching the lumber to a scrap board at the angle you wish ripped and running the scrap against the fence. (See Figure 57.)

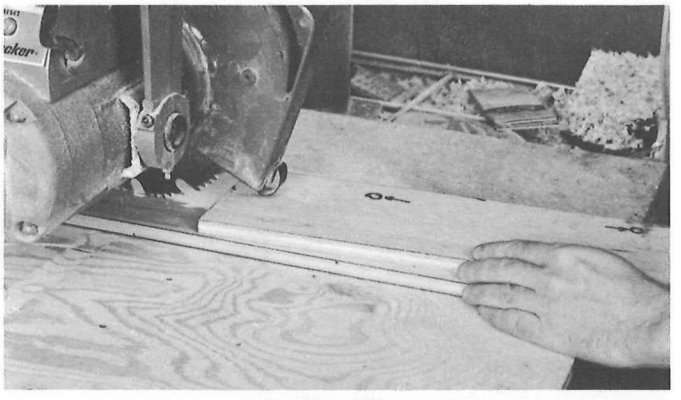


Figure 57

To saw a taper rip, fasten the piece to be ripped, at the desired angle, to a straight piece of scrap. (Arrows in photo indicate brads holding lumber in place.) See text for further instructions.

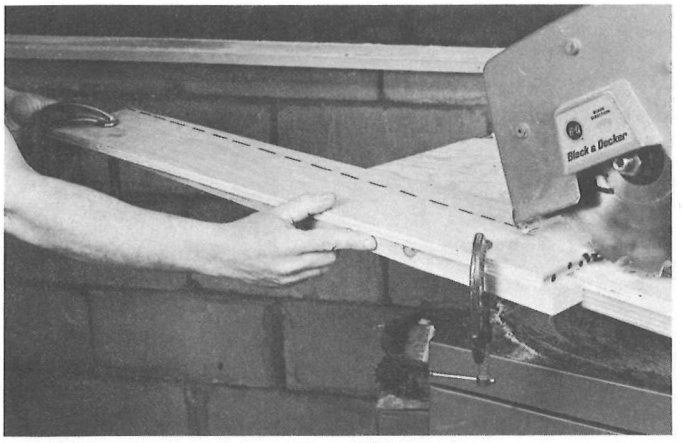


Figure 58

Scrap piece used as guide clamped under piece to be taper ripped. See text.

If you do not know the angle you wish to taper rip engage the blade about 1/16" into a piece of scrap in the in-rip or out-rip position and score the surface with the saw blade. Then nail or clamp on the piece you wish to cut so the taper line is directly over the scored line on the scrap. Rip the taper without making any change in the set-up.

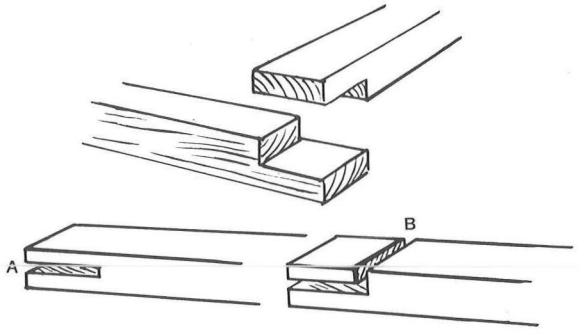
On very long taper rips clamp a piece of scrap under the lumber to be cut at the proper angle. Run this underside guide against the front of the table as you rip the lumber. This method can also be used to cut out a warp or bow from a board or can be used to cut any straight edge on an uneven edge of lumber.

Chapter 5
Joints

Most joints can be made in many positions of the saw blade or by using different accessories. Some of the following possibilities are shown with the simple ½ lap joint but remember all others can be done in the same or similar manner. The following illustrations will show how the first and simplest joint can be made.

1st Joint—½ Lap

1st method—Saw Blade



A - Cut the horizontal cut first.

B - Cut the vertical cut next.

Figure 59

2nd method—Dado in vertical position. (See Figures 60, 61 and 62.)

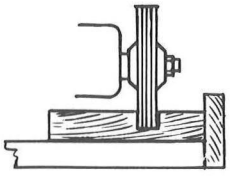


Figure 60

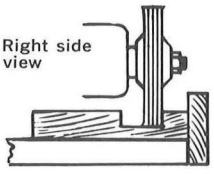


Figure 61

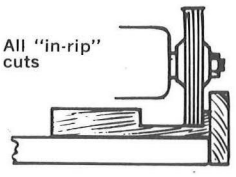


Figure 62

3rd method—Dado in horizontal position. (See Figure 63.)

4th method—Dado in rip position using a pusher to keep the piece square to the fence. (See Figure 65.)

5th method—Dado in horizontal rip position using pusher stick to keep the stock square to the fence. (See Figure 64.)

6th method—sliding jig method. (See Figure 81, Page 34.)

7th method—same as 4 and 5 above using the saw blade in two cuts. Horizontal 1st and vertical 2nd.

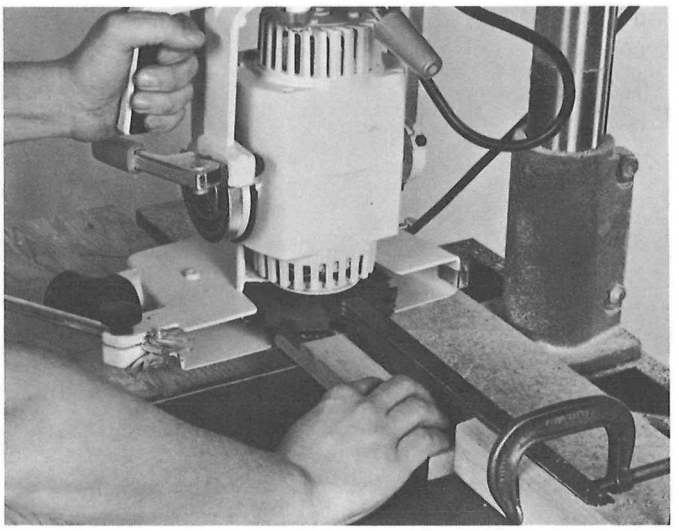


Figure 63

The half lap joint can be made with the dado in the horizontal position and an elevating jig, as shown.

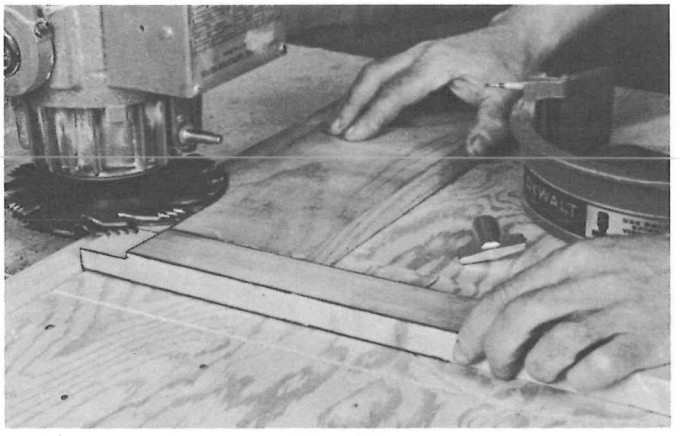
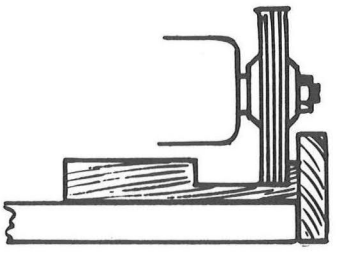


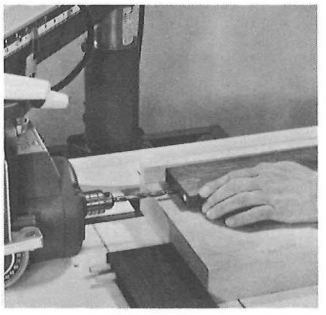
Figure 64

Square scrap piece used to assure a good cut on long, thin pieces. Guard has been removed for photographic purposes only.



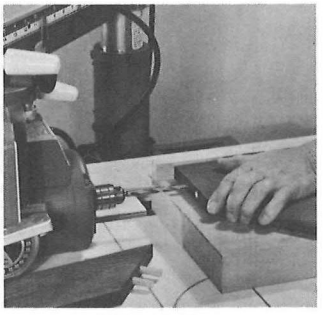
Pusher stick not shown

Figure 65



End Boring

Figure 66



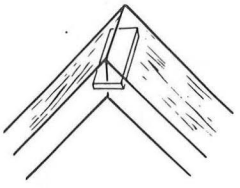
Miter Boring

Figure 67

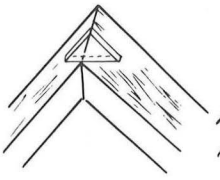
2nd Joint—Miter Joint. (This joint is good looking but not strong enough unless it is doweled or splined.)

To dowel (See Figures 66 and 67). Be sure dowel hole is exactly in the center line of the lumber.

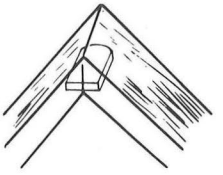
To spline (See Figures 68 through 73).



Flat spline
Figure 68



Edge spline
Figure 69



Blind spline
Figure 70

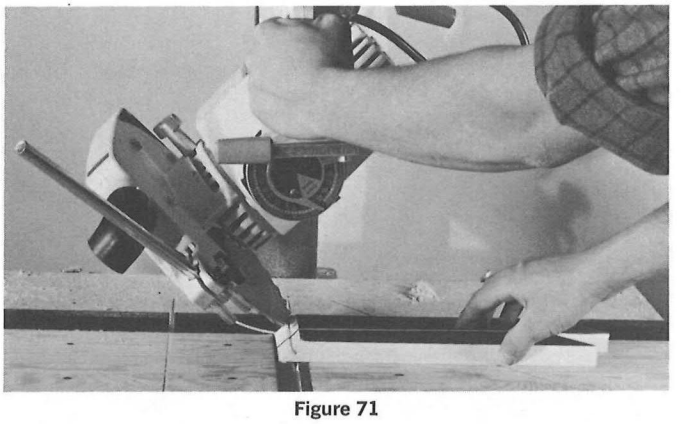


Figure 71

Spline grooves are being cut two at a time to assure a perfect match.

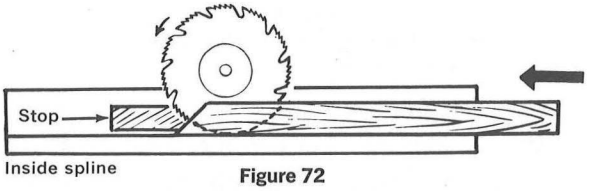


Figure 72

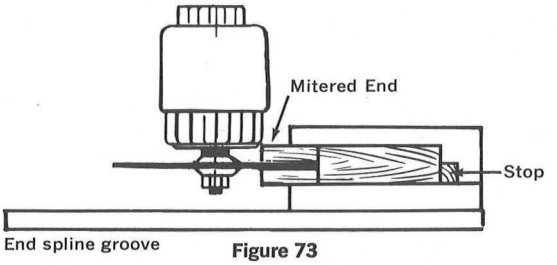


Figure 73

3rd Joint—Bevel Miter. (This joint can be cross-cut in the bevel position or ripped if the length of cut is more than 13″. It can be splined in the cross-cut position or the rip position. (See Figures 74 and 75.)

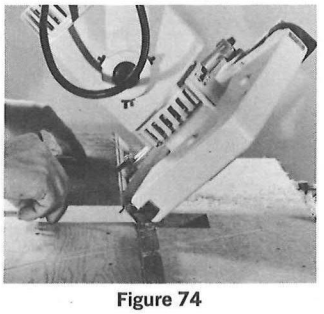


Figure 74

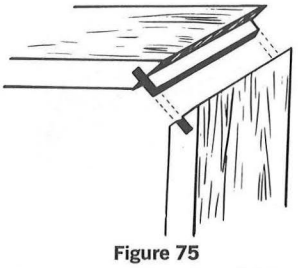
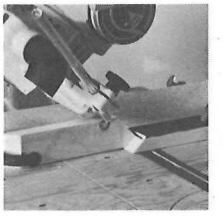


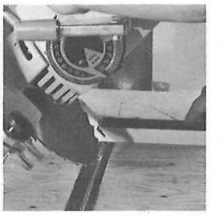
Figure 75

Spline groove being ripped into the bevel cut on lumber longer than 13″.

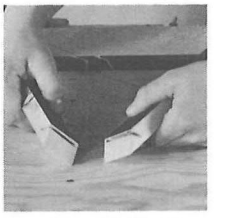
This spline groove can be made blind by climb-cutting one groove and feed cutting the other side in the cross-cutting position only. (See Figure 76.)



Blind splines—use a stop and climb cut first piece partially through.



Feed cut the second piece partially through.



Complete blind spline.

Figure 76

It is extremely difficult to make the spline groove blind on **both** ends. It is also difficult to make it blind at one end, in the rip position, because we cannot feed-cut rips. To cut it blind on one end the blade must be slowly lowered to the desired spline depth and after each change of depth (about ¼ turn) the lumber drawn away from the fence to cut the stock away from under the blade.

(Revolving saw blades cannot be dropped into stock when they are any angle other than 90° to the table.) Rip spline grooves open on the two ends are done with the beveled edge against the fence.

Lock Spline (See Figure 77). This lock spline is made with two cuts of the saw blade, one vertical and one horizontal. The splines are inserted in short sections from each rotated 90° to one another. Once this joint is put together it cannot be taken apart.

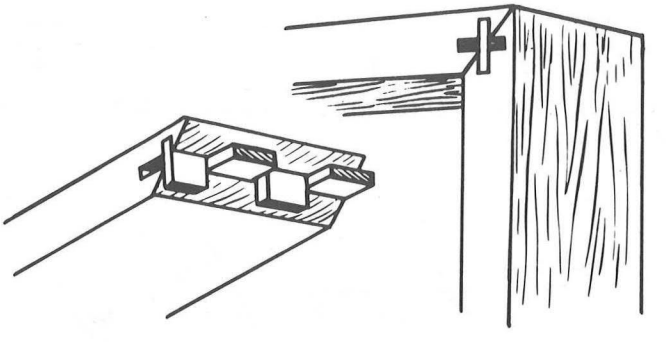


Figure 77

4th Joint—Open Mortise and Tenon (See Figures 78 through 81). This joint is similar to the ½ lap joint and can be made in many ways. The best method to make this joint is with a dado head with the lumber on an elevating jig and the dado in a horizontal position. For production cutting on short lengths use a sliding table jig with the dado in a horizontal position and feed-cut the ends of your stock in the rip position.

The open Mortise and Tenon illustrated in Figure 78 requires one set-up to make the male and a different one to make the female.

If you make a double open Mortise and Tenon only one setup is required, for the male and the female are the

same, one fitting into the other by turning one up-side down. (See Figure 83.)

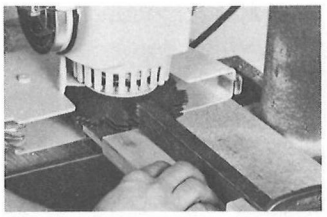


Figure 78

Using an elevating jig, dado is cutting second half of tenon.

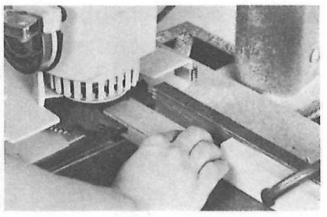


Figure 79

Using same jig and stop dado is cutting mortise.

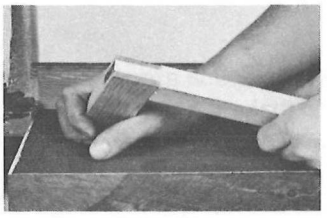


Figure 80

Completed open mortise and tenon.

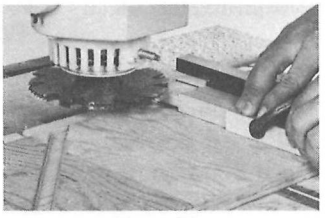
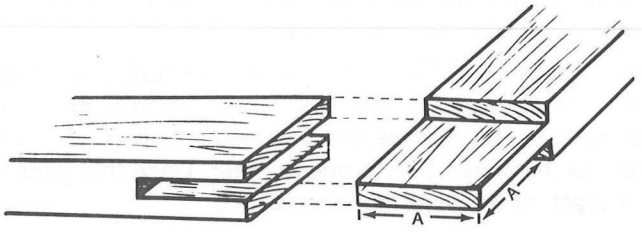


Figure 81

Sliding jig method for sawing, shaping or dadoing the end of a piece of wood. Support fence on jig set at 90°. Guard has been removed for photographic purposes only.



Open Mortise and Tenon

"A" must be the same length—if the two pieces are the same width

Figure 82

A suggested Dado set-up for ¾" stock is as follows. (See Figure 84.)

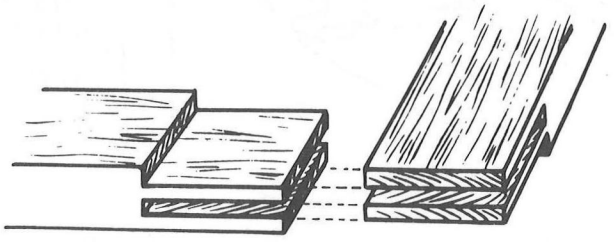


Figure 83

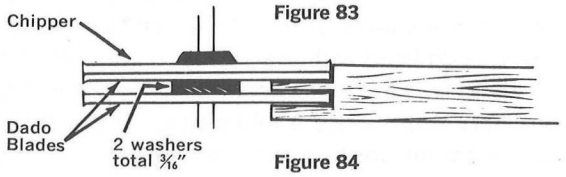


Figure 84

If you use a flat ground dado with a set tooth, use a total of 3/16" spacers between the Dado blades. The overlapping set of the two blades will make the tongue thinner. A ⅛" set Dado blade cuts slightly wider than ⅛" because of the set. If a hollow-ground Dado is used, use only a ⅛" spacer.

5th Joint—The Half-Lap Miter Joint (See Figures 85 and 86).

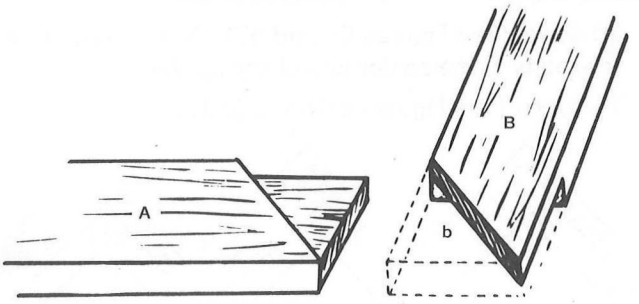


Figure 85

In this joint piece (A) can be cut with the Dado set down ½ the thickness of the lumber. The arm mitered at 45° to the right.

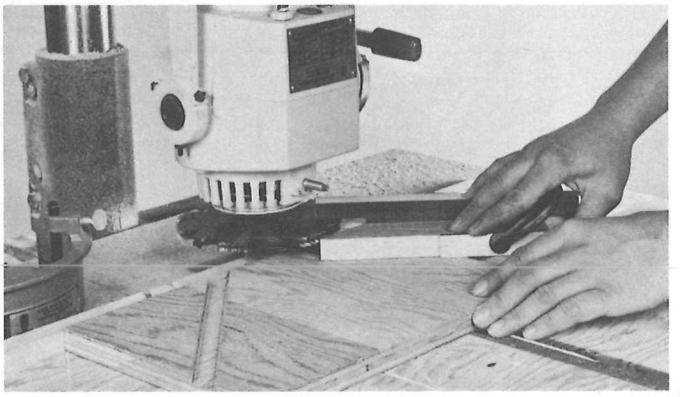


Figure 86

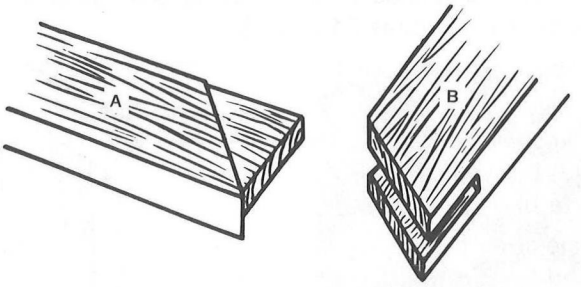
Sliding jig method for cutting half lap miter. Guard has been removed for photographic purposes only.

Piece (B) is Half-Lapped with the Dado at 90° miter and piece (b) trimmed off with the saw blade at 45° miter.

Piece (A) can be made with the sliding table jig but with the support fence set at 45° instead of 90° as shown in Figure 81.

The Half-Lap miter joint is mitered on one side and butted on the other side. If you wish a stronger miter, to be mitered on both sides, make the next joint shown. (See Figure 87 and 88.)

Piece (A) in Figure 87 should be cut with the same Dado setup as the regular Open Mortise and Tenon except that the arm is mitered at 45°. If the sliding table jig is used, the support fence is set at 45°.



Open Mortise and Tenon Mitered Joint

Figure 87

Piece (B), the groove, in Figure 87 is cut square and the miter trimmed off 45° with the saw blade.

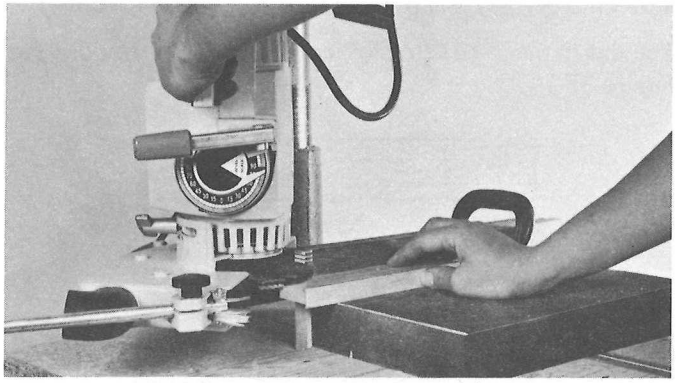


Figure 88

Elevating jig method for cutting 45° open mortise and tenon miter joint.

6th Joint—The Lock Joint—Sometimes called a Box Joint. (See Figure 89.)

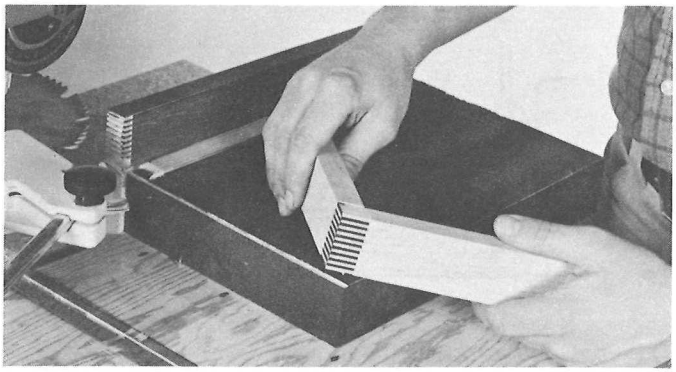


Figure 89

Lock joint made with the elevating jig.

In order to make the above joint with the saw blade you must know the thickness (as best you can) of the kerf of the saw blade you are using.

For example, with a blade having a kerf of 1/16" we take a pass so the blade just skins the bottom of the stock. If we now turn the elevating handle 1/2 turn the blade will come up 1/16". If we continue elevating 1/2 turn and cutting after each 1/2 turn we would cut all the lumber off. Instead we want to cut a groove and leave a tongue between that groove and the next one. The tongue should be the same thickness as the groove.

Therefore, turn the elevating handle so the elevation is twice the thickness of the kerf. In this case 1/8" or a full turn.

If the completed joint is too loose when the pieces are put together, the tongues are too thin. Remember, the grooves will always be the same (the thickness of the blade) but you can make the tongue thicker by elevating a little bit more.

On the other hand if the completed joint is too tight, you turned the elevating handle up too much.

The above described joint is extremely strong because of the large glue area.

It is limited in height because the saw blade is in a horizontal position and only one cut is made at a time.

However, several pieces can be ganged together so two or more joints can be made at one time.

The elevating jig is used for guard clearance and the blade starts 2" above the table.

Elevating the arm will only take it up 1 and 7/8" higher than the 2" mentioned above.

The stock, of course, can be turned up-side down and the cuts continued by lowering the arm.

The above process will cut a lock joint on lumber 3 3/4" high only.

If you wish to put a lock on taller, wider lumber you must use the sliding table jig.

If this jig is made of 1/4" ply and the fence is cut 1/4" above the table you can start your first cut 1/4" above the table instead of 2" above it.

Also you can locate the blade next to the collars instead of in-between the blade collars. This will give you another 3/8" or a total of 2 1/8" plus the 1 3/8" we had before.

You can now work on a piece of lumber 4" high and by turning it over work a total of 8".

Hints on making Lock Joints. (See Figure 90.)

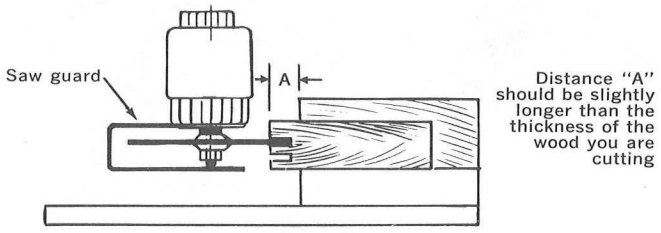


Figure 90

Engage the blade into the lumber slightly more than the thickness of the mate. This will make it easy to sand off the protruding ends to get a good looking joint. (See Figure 91.)

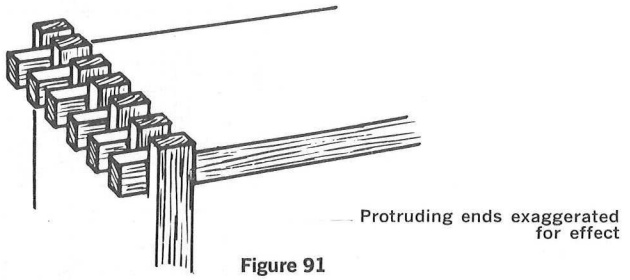


Figure 91

If the tongues are slightly short and the entire side will need a lot of sanding to get a good joint. (See Figure 92.)

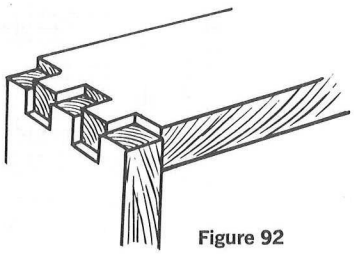


Figure 92

Elevate one of the mates the thickness of the kerf with a shim of lumber. This will make the top and bottom even instead of off-set. (See Figure 93.)

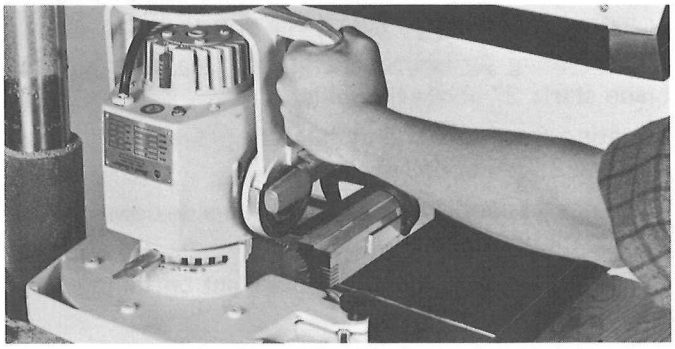


Figure 93

Lock joint using elevating jig. Notice back piece elevated the thickness of the kerf. A shim has been placed under the back piece and cannot be seen in this photo.

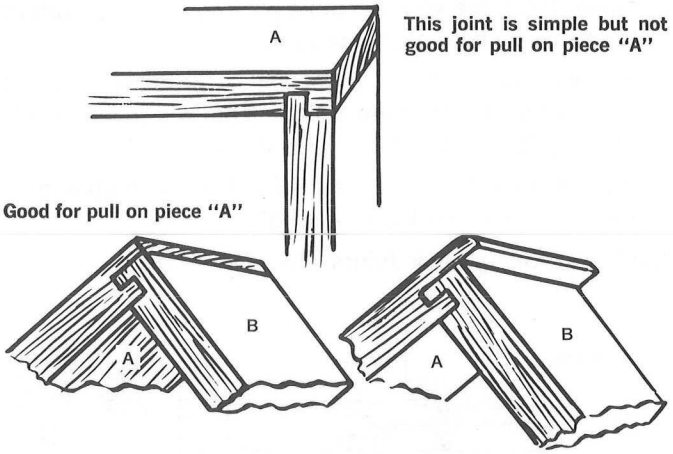


Figure 94

Drawer Front Joint (See Figure 94). (The drawer front joint is a simple and stronger corner joint where the pressure on piece (A) is a pull such as on a drawer front.)

The cut in piece (B) (for ¾" lumber) is a ¼" dado. (See Figure 95.)

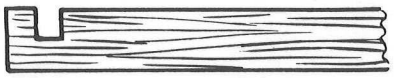


Figure 95

Piece (A)—1st cut—Dado in horizontal position. (See Figure 96.)

Figure 96

2nd cut—Dado or blade in vertical position. (See Figure 97.)

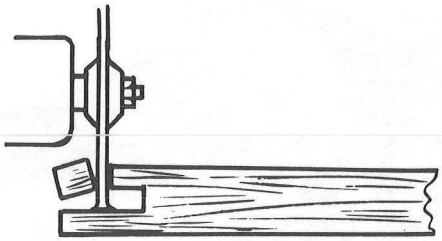
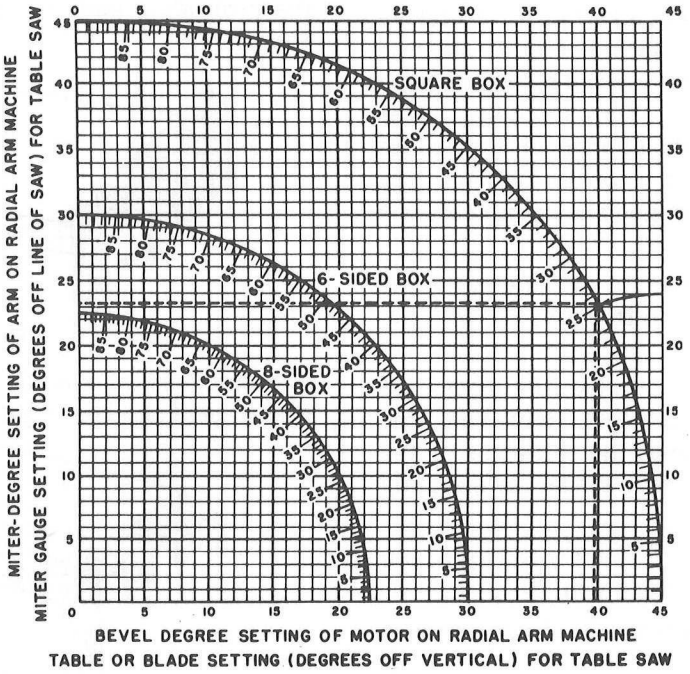


Figure 97

The joints just discussed are more or less basic and your imagination is your limitation. Most joints can be cut in a variety of positions. You select the one best suited to your project.

COMPOUND MITER CHART—CHAPTER 6



Chapter 6
Cutting Moulding and Compound Cuts

This is probably the most difficult operation to perform with accuracy. A piece of crown moulding can be cut 18 different ways only **one** of which is correct. To cut a piece of moulding flat is no problem except that it must be cut right and left hand. (See Figures 98 and 99.)

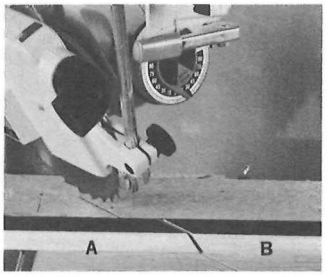


Figure 98

Compound cut on flat stock with the upper side darkly stained. Notice position of piece "A" and "B".

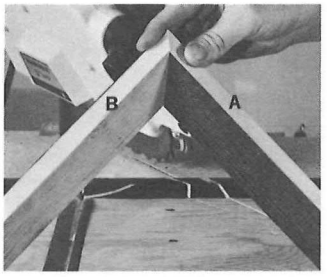


Figure 99

When pieces are assembled dark stain on piece "A" is inside. On piece "B" it is outside. This single cut only works on flat stock.

The left hand miter is off the work table with the fence in its normal position.

Move the fence back to the last space and the cut will be on the table.

If you find the spacer boards too low because of your ¼" lamination, place a piece of ¼" scrap under them and bring them up to the same level as the laminate.

The complications come when you want to compound or shadow-box the joint.

There are two methods to make a compound cut on moulding.

THE FIRST METHOD.

Determine the number of sides.

Determine the pitch of the moulding.

Determine the proper miter angle.

Determine the proper bevel angle.

The chart at left will give you all four figures for a 4, 6 or 8 sided box.

To cut the right hand miter:

Set the angle (found on the chart) on both miter and bevel scales and you will cut the right hand miter with the moulding flat on the table. (See Figure 98.)

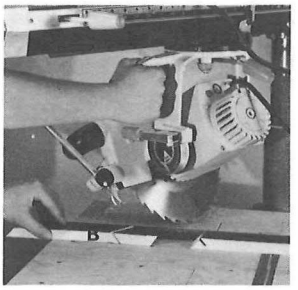


Figure 100

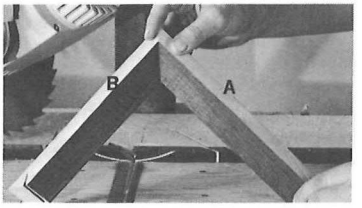


Figure 101

To get the faces to match, piece "B" is cut with a left hand miter. See text for setting of scale and position of piece "B".

Completed compound cut on flat or moulded stock where faces match.

To cut the left hand miter:

Do not change the bevel setting.

Move the arm to the same miter setting on the left side.

Rotate the right hand piece 180° (piece B).

Place this piece against the fence and cut off the waste triangle from its end. (See Figure 100.)

If your selection of angles was correct the two will match and the angle between them will be 90°.

To spline a compound cut:

Make the two compound cuts (right and left hand).

Subtract the bevel angle from 90°.

Set this angle on the bevel scale.

Without changing the right miter angle, elevate the blade about 3 turns and cut the fence.

Place the right hand miter so the spline cut will be where you wish.

Then make the cut.

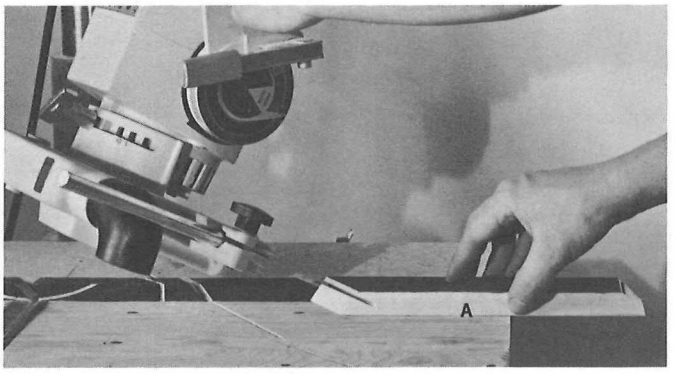


Figure 102

Spline groove being cut in piece "A". See text for proper angle setting.

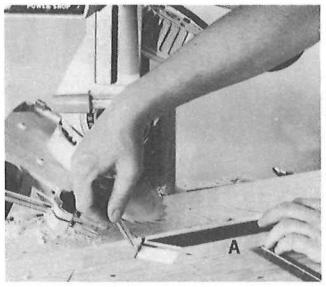


Figure 103

Saw mitered to the left and piece "A" matched to groove cut in the fence. Fence is marked so piece "B" can be cut with matching spline. See text for proper settings.

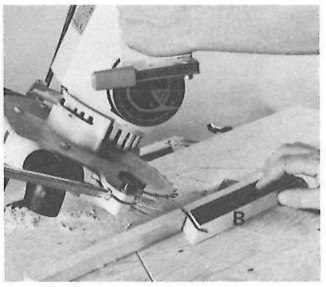


Figure 104

Piece "B" set at line in the fence for cutting matching spline to piece "A".

Don't change the bevel angle but miter the arm to the left side to the same angle as the right.

Cut the fence.

Place the right hand miter, you just cut, against the fence so the cut in the fence and the spline cut in the moulding match.

Draw a line or clamp a stop on the fence at the end of this piece of moulding.

Place the left hand piece of moulding on the line or against the stop and cut the spline in it.

To make a blind spline, feed cut one side, and climb cut the other.

THE SECOND METHOD TO MAKE A COMPOUND CUT ON MOULDING—WITH A JIG.

Right and left hand miters can be cut with the arm at 90° to the fence and the lumber held at 45° to the fence. To make a simple jig, cut a piece of lumber as shown in Figure 105.

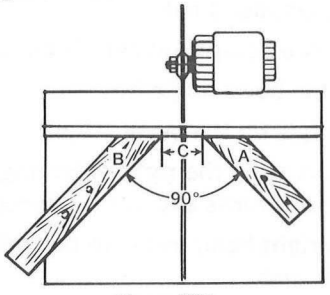


Figure 105

Nail down (A) and (B) so they are 90° apart and 45° to the saw cut. Be sure distance (C) is as wide as the moulding you will cut. (See Figure 106.)

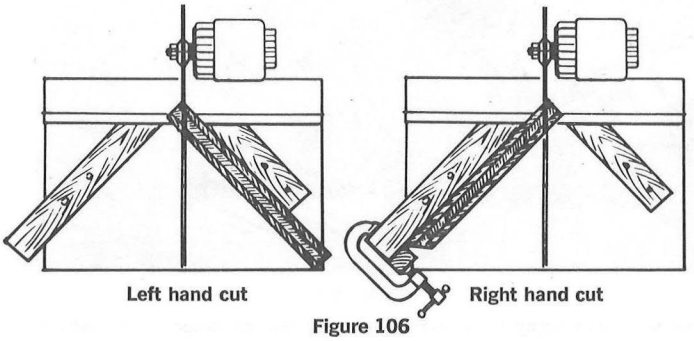


Figure 106

Remove the fence and cut the left hand miter by placing the moulding on piece (A).

Cut the other end (right hand miter) by placing the moulding on piece (B).

Make piece (B) a little longer than the longest side of the frame and use a stop to be sure the opposite sides of the frame are the same length.

When cutting crown mouldings, use the same jig, only set the moulding as it would appear on the wall and ceiling. (See Figure 107.)

Note: The jig can be made on a piece of plywood ¾" thick and a false fence nailed on its underside. This fence is then clamped in place of the regular fence.

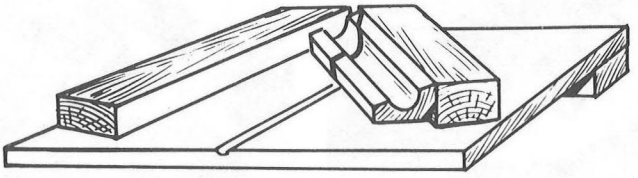


Figure 107

If you wish to cut it flat against a support, determine the angle the moulding rests at. (See Figure 108.)

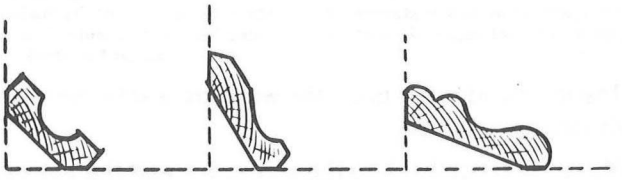


Figure 108

Some are 45°, some 60°, and some are harder to determine. To make a support just tilt the blade in the rip position until it is the same angle that the moulding will rest. Then rip in half a piece of 2 x 4 about 20" long at this angle. Now use the ripped 2 x 4 to make the jig. (See Figure 109.)

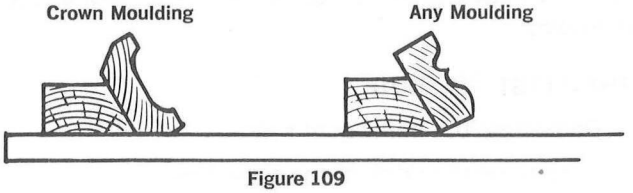


Figure 109

This same method can be used in making any shadow box frame and will work on lumber up to 3" wide. (Beyond that, the chart method must be used.)

Important facts about cutting picture frames.

The opposite sides **must** be the same length.

Use a hollow-ground blade and cut slowly for a finished miter cut.

Sanding the miter joint can throw it off.

Any error in angle will show up 8 times as large on the last joint.

The miter jig described in Figure 107 can be used as a

miter clamp to hold the pieces while they are glued and nailed.

If you are not sure of the angle settings cut a very small frame of scrap wood. If a small frame fits, a big one will fit too.

Spline nails are available for picture frame work.

Another simple jig almost the same as the one just described can be made out of two pieces of wood about 12″ wide.

An even simpler jig can be made of one piece of wood cut square and the blade set at 45° mitered to the right as shown in illustration below. All jigs so far are for cutting mouldings flat. (See Figure 113.)

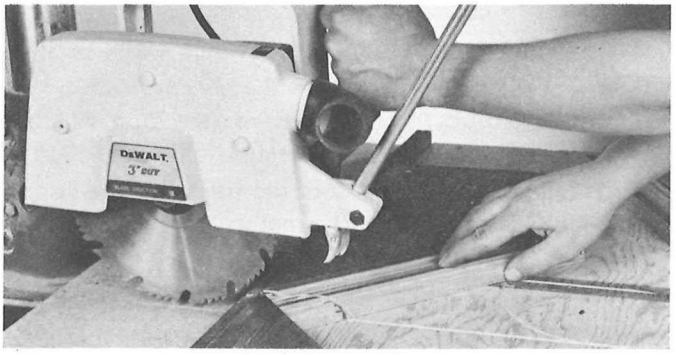


Figure 110

Left hand miter using flat jig for cutting moulding.

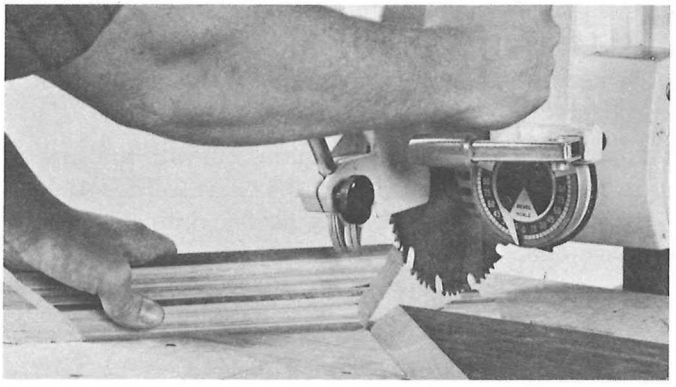


Figure 111

Right hand miter cutting compound cut on moulding using miter jig with edges beveled to the pitch you desire on the frame.

Figure 112

Completed compound mitered corner using flat miter jig with beveled edges.

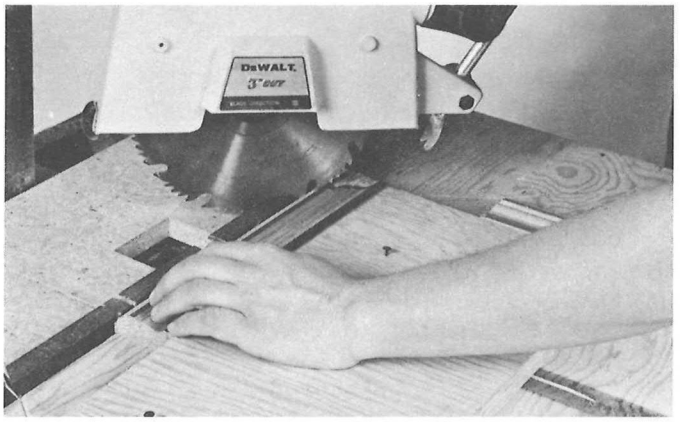


Figure 113

Left hand miter being cut with arm 45°, square miter jig set in place.

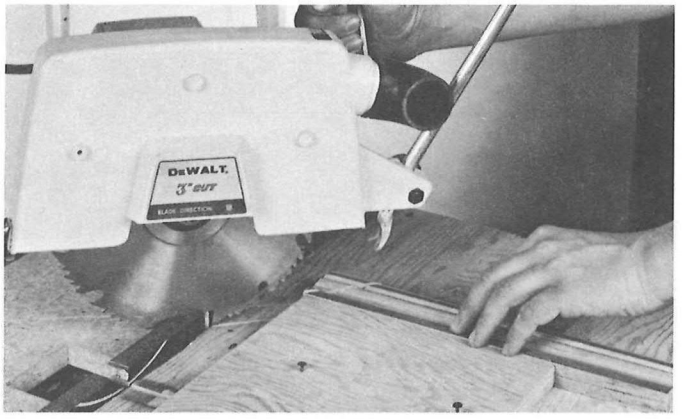


Figure 114

Right hand miter being cut with square miter jig.

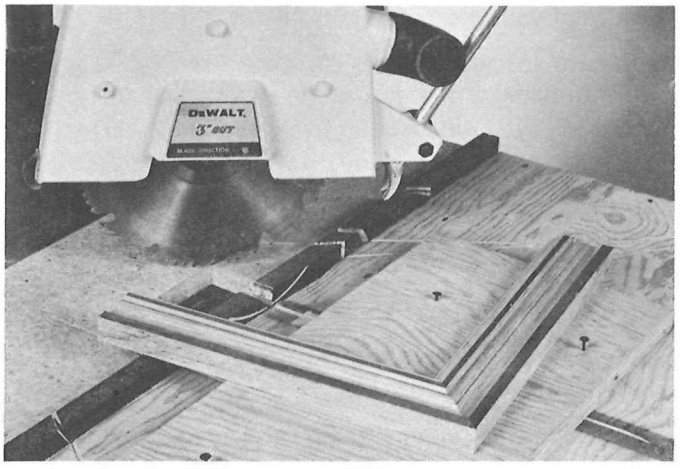


Figure 115

Completed flat miter joint using square miter jig.

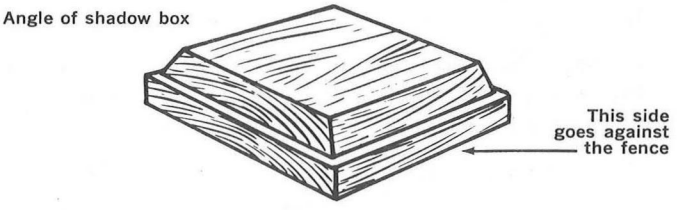


Figure 116

This jig can be made to cut a compound cut (shadow box)

Chapter 7
Cutting Plywood

Plywood is difficult to cut on any saw because of its large size and weight. You must use the proper blade for cutting plywood. (See chapter on Saw Blades.)

Ripping plywood—Ripping plywood is no problem. Just follow the rules for regular ripping.

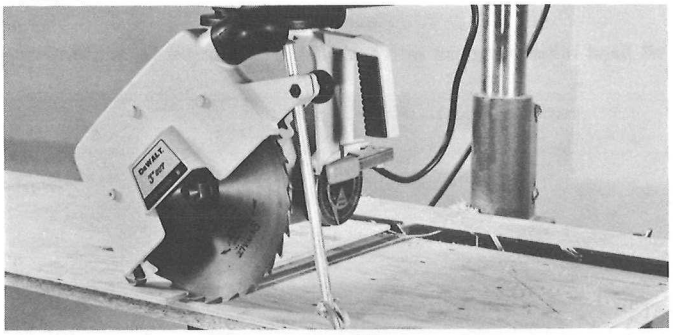


Figure 117

Saw in out-rip position with fence in normal position. If the fence is moved all the way back the maximum rip width is 24½".

The maximum width is 24½".

If the desired piece is wider than this amount, you must proceed as follows:

Subtract up to the maximum amount from the total width of your piece and cut off this difference.

Be sure to measure this distance from the fence to **The Outside** of the saw blade. If you do not do this correctly, you will lose the thickness of the kerf.

For example: to cut 3′ off a 4′ panel you must cut off 1′ (less the blade kerf) and be left with 3′.

Taper ripping

Remove the fence.

Clamp a straight piece of scrap under the ply at the angle you wish it to taper.

Slide this piece against the front edge of the table.

Use the in-rip or out-rip position.

Cross-cutting the panel

If the cut is 24½" from the end or less, rip it off.

If the cut is more than 24½" from the end—revolve the yoke 180° so the blade, as it faces you, will make a feed cut as it's pulled out.

Clamp the fence all the way back.

Elevate the saw so the panel can slide under it. Push it back against the fence.

Move it to the right or left so the blade will cut it at the desired size.

Once determined, nail or clamp a piece of scrap, on your extension, against the end of the panel. (Right or left side, or better still on both sides.)

Slide the panel away and lower the saw blade so it will sever the panel.

Turn the saw on.

Using the guide, slide the panel into the blade until it reaches the fence.

SAFETY TIP Pull the saw forward (sawdust will be thrown at you, so wear eye protection and stand clear).

When the saw is at the end of the track, lift the panel until it hits the bottom of the motor. (This will cut 25" with a 10" blade.)

Turn the saw off and push the saw all the way back.

Flip the panel upside down, and using the same guide, repeat the operation to sever the panel. (Repeat last 4 steps.)

If you do not have extensions, draw a line on the plywood and cut on this line.

This operation can only be made with the blade 90° to the table.

Important—If you try to make this cut with the saw in its normal cross-cut position the blade will climb over the lumber as the panel is pushed into it. **This is dangerous.**

Beveling the panel

First cross-cut it square as described.

Then rip it at the bevel angle desired.

Wherever possible we climb-cut plywood with the good side up and feed-cut it with the good side down.

Figure 118

With the saw in the 90° cross cut position and rotated so the blade is on the right, the panel can be pushed into the blade 7" until the panel meets the fence.

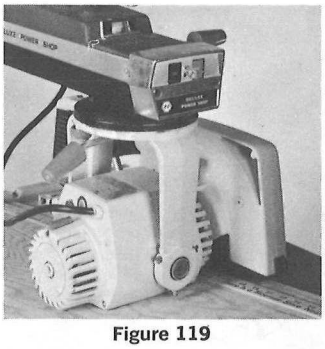


Figure 119

With the saw pulled forward to the end of the track, lift the plywood until it touches the bottom of the motor. This will cut 25½" with a 10" blade.

Chapter 8
Attachments

Dado—The first and most important attachment is the dado head. There are basically two types of dado heads. 1—Blades and Chippers; 2—Tapered Washer Dado Sets (Quick Set).

Blades and Chippers—this type is most popular:

They can be set from 1/8" to 13/16" (larger by adding more chippers).

Minute changes can be made by inserting paper washers between any of its components.

When the dado gets very wide the outside collar washer can be eliminated.

The teeth of the blades cut slightly deeper than the chippers. (See Figure 120.)

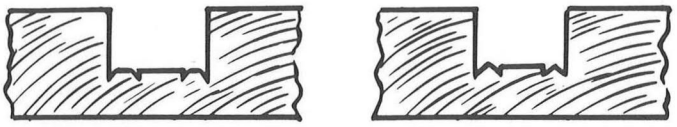


Figure 120

Groove from flat-ground dado **Groove from hollow-ground dado**

When using two flat-ground set-tooth blades to cut 1/4", the set on the teeth must point in the same direction.

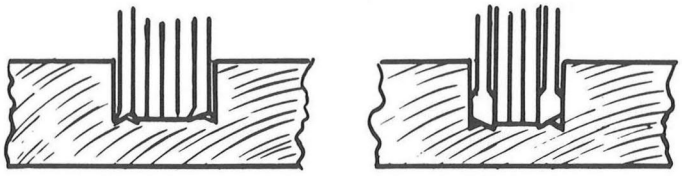


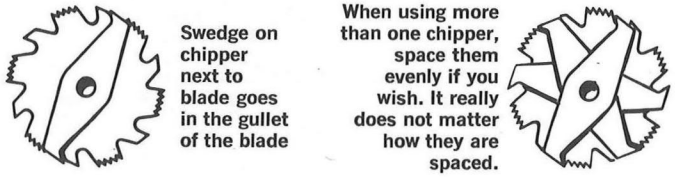
Figure 121

Flat Dado—the groove is larger than the total set-up **Hollow Dado—the groove is exactly the same as the dado set-up**

With a hollow-ground dado it does not matter how the blades are placed.

Flat-ground set-tooth blades cut slightly wider, than 1/8" due to the set.

The chippers are swedged to overlap one another's cut. When a chipper is against a blade (or blades) the swedge must go into the blade's gullet. (See Figure 122.)



Swedge on chipper next to blade goes in the gullet of the blade

When using more than one chipper, space them evenly if you wish. It really does not matter how they are spaced.

Figure 122

When using more than one chipper, space them evenly if you wish. It really does not matter how they are spaced.

Dado sets must have all parts sharpened at the same time even if some have never been used.

Most dados have two (2) 1/8" thick blades: four (4) 1/8" thick chippers and one (1) 1/16" chipper.

The Tapered Washer Dado Set:

The blade, or fixed steel tool bits, are cocked at an angle depending on the setting of the tapered washers.

The advantages of this type of dado are:

It cuts a clean flat bottom.

The width of the dado can be changed easily.

Sharpening costs are slightly less.

What the Dado can do:

Basically they cut grooves—each type of groove has a different name. (See Figure 123.)

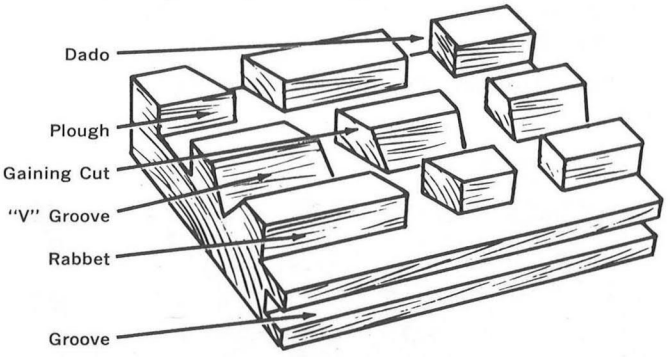


Figure 123

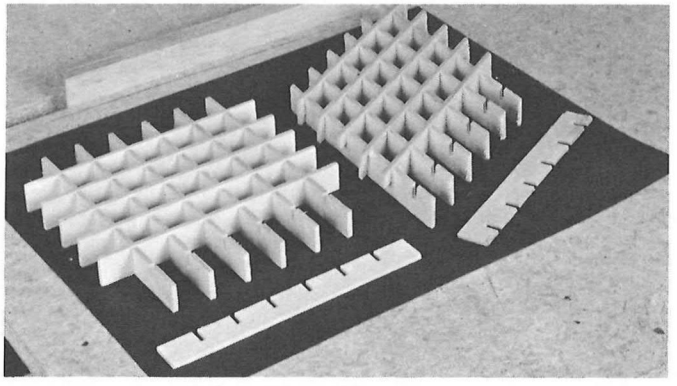


Figure 124

Dado grooves or saw cuts evenly spaced halfway through the lumber cut square to the fence or at an angle will make egg crates if the pieces as shown are ripped to the width of the dado grooves. This cut is not in the text.

Radius cuts with the Dado:

Set your Dado set at 45° bevel.

Set the arm 90° to the fence.

Engage the Dado into the lumber about 1/2 the width of the Dado.

Place the lumber in the "in-rip" position.

Locate the Dado so the radius cut will be at the desired place and lock the rip-lock.

SAFETY TIP Push the lumber under the Dado head—**Be sure to use a pusher stick to eject the lumber.** (See Figure 125.)

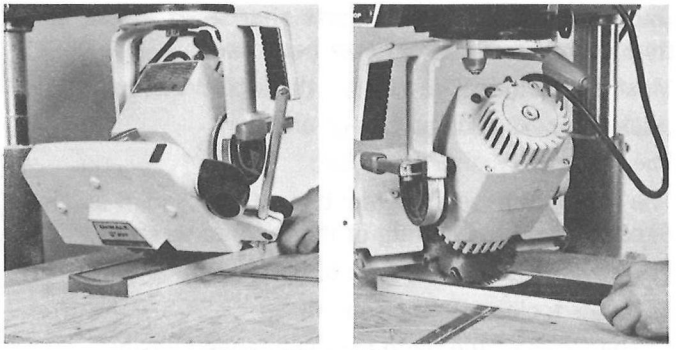


Figure 125

Radius cut being made with the dado.

Eliptical radius cuts with the dado set at 45° bevel and the yoke located and locked between the cross cut and rip positions. Lumber is fed from right to left.

If you wish to make a deeper radius cut, lower the arm and make a second cut.

Pegs with the Dado: Pegs can be cut on the end of a piece of lumber—

Make a jig as shown in Figures 126 and 127.

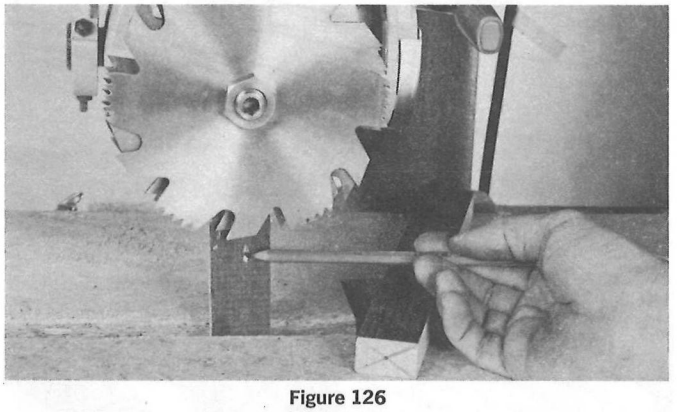


Figure 126

Simple jig to make round pegs on the end grain. A nail is used to rotate piece to be pegged. Saw guard has been removed for photographic purposes only.

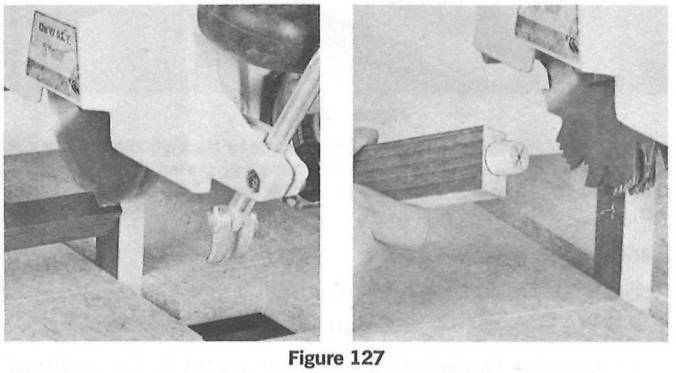


Figure 127

Rotate the piece to be cut *clockwise* to complete peg.

Completed peg.

Clamp this jig in place of the fence.

Locate the Dado against the jig so the blade is ½ the thickness of the stock above the nail.

Locate the center of the stock on the end you wish to peg.

Pivot the stock on the nail at this point.

Hold the stock straight out and level with the left hand.

Turn the saw on with the right hand.

Revolve the stock clockwise with the right hand until the peg is cut.

If you wish the peg smaller in diameter: lower the Dado with the right hand (while it is revolving) and hold the stock tight with the left hand.

Revolve the stock again until the peg is completely recut.

Pegs do not have to be in the center of the stock. The location will depend on the pivot point. (See Figure 128.)

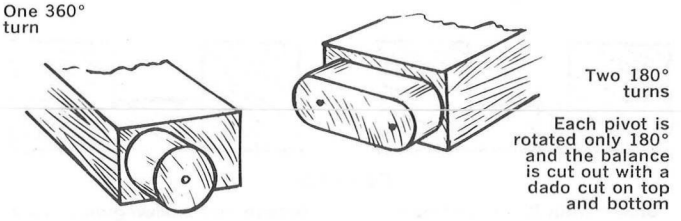


Figure 128

Rings can be cut a few inches off the ends by moving the Dado set out. (See Figure 129.)

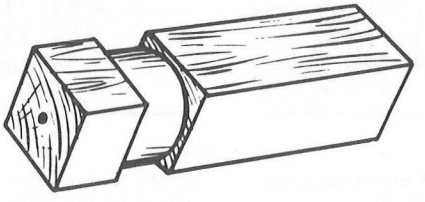


Figure 129

If you wish to cut rings or wish to make a square piece round for its entire length, you must pivot the stock on both ends. (See Figure 130.)

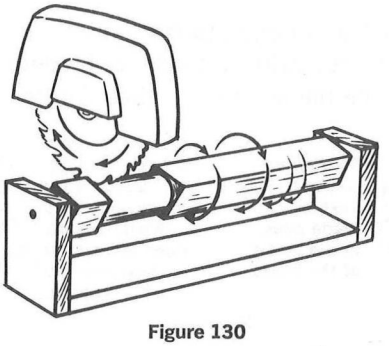


Figure 130

If one pivot is higher than the other, the piece will taper. (See Figure 131.)

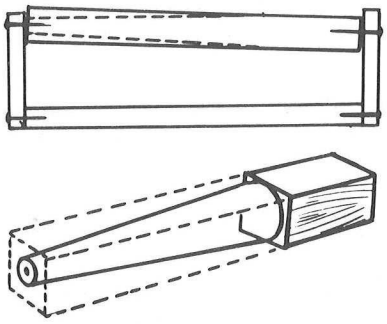


Figure 131

Spirals on dowels can be cut by rotating dowel against the fence with the dado set at an angle.

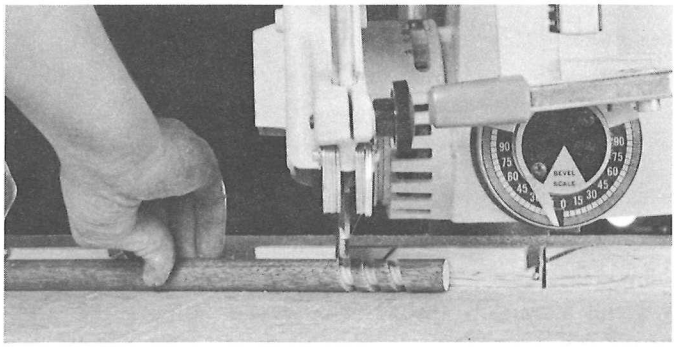


Figure 132

To cut spirals turn dowel toward you holding it snug against the fence. The thread will feed itself.

Castellated Mouldings with the Dado:

Make a series of Dado cuts cross-grained and evenly spaced. (See Figure 133.)

Rip off this piece (use a hollow-ground blade) into strips of moulding at any desired width. (See Figure 134.)

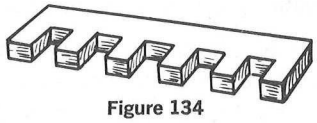


Figure 134

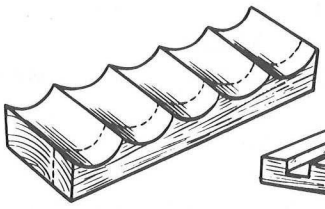


Figure 135

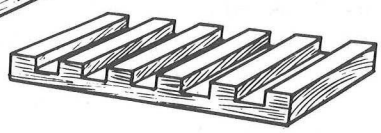


Figure 133

By making cross-grain radius cuts (be sure the lumber is clamped down for each cut) you can make scalloped moulding. (See Figure 135.)

Lattice Work with the Dado:

Make a series of evenly spaced gaining dado cuts at any angle, slightly deeper than ½ the stock.

Repeat this operation on the other side and a lattice will appear.

If the miter angle is 45°, the holes will be square.

If any other angle is used, the holes will be diamond-shaped.

Things to know about the Dado:

Set-tooth Dados cut slightly wider than the thickness of the Dado due to the set.

Dados cut away large amounts of wood and have a tendency to climb easily when cross-cutting.

If they climb too much on cross-cutting, hold the lumber down tightly and feed-cut the dado cut.

Dado cuts, feed or climb (rip or cross-cut), have a tendency to lift the lumber.

Always push the lumber (rip position) down as well as forward.

Vertical feather-boards are a great help in holding dado cuts (ploughs) down.

To cross-cut a dado on a warped board, press the board flat as shown in Figure 136.

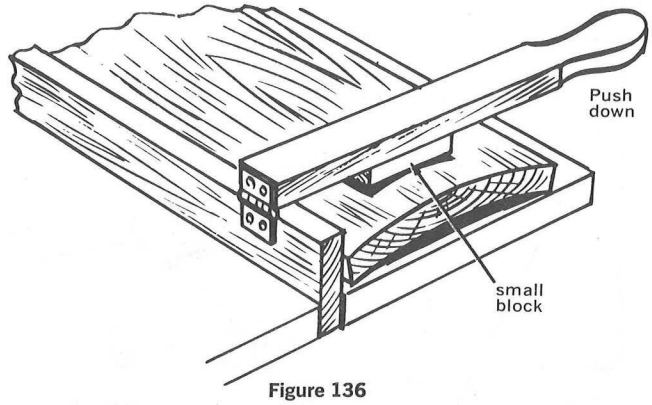


Figure 136

Place the board at the desired location.

Press down on the jig handle with the left hand.

Cut the dado cut by pulling the saw with the right hand.

The jig handle can be clamped down if you wish.

In ploughing wide grooves, when two or more passes are required, make the cut furthest from the fence first. (See Figure 137.)

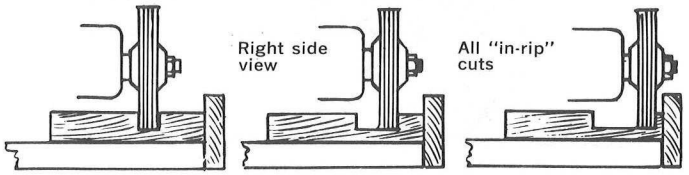


Figure 137

Rabbets are best cut with the Dado in a horizontal position.

Dado cuts, longer than the length of the arm permits, must be made by cutting from each end. To be sure the Dados match, proceed as follows:

Cut the first Dado as far as you can.

Elevate the Dado head until the piece can be removed, counting the number of turns of the elevating handle.

Turn the lumber around.

Lower the Dado into the groove you just cut (count the

same number of turns down). The saw is now out or near the end of the track.

Turn the saw on and continue the Dado cut by pushing it back (feed cutting). This will insure the continued cut to match the first cut.

The Dado can be used to cut large curves.

Place the Dado in a horizontal position just protruding through the fence.

Pivot the lumber on a jig directly in front of the Dado.

Swing the jig from right to left engaging the Dado on the edge of the lumber to be cut. (See Figure 138.)

Curved rabbets and shapes can be made the same way.

Complete circles can be made, rabbeted and shaped the same way but the corners should be trimmed off first so the Dado does not have to cut off too much. (See Figure 139.)

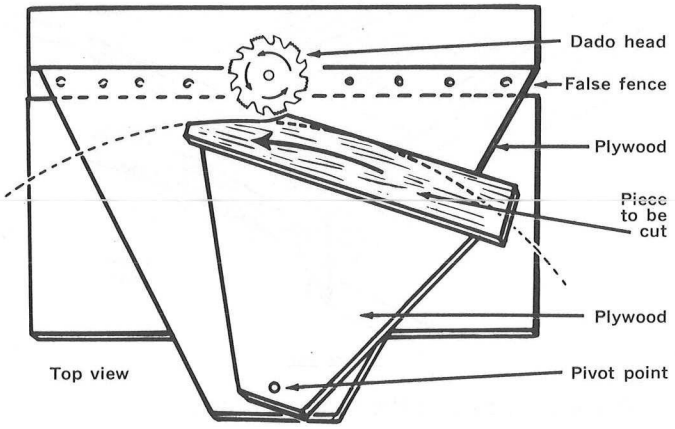


Figure 138

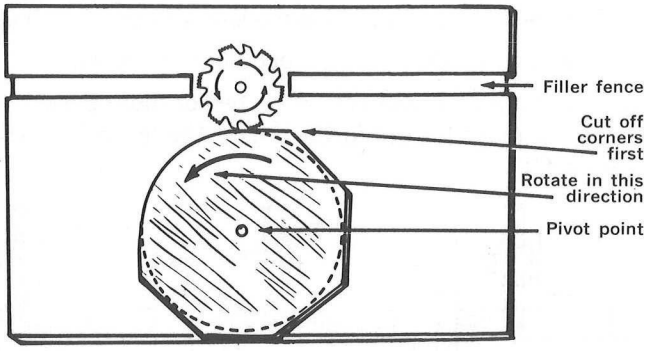


Figure 139

How to cut through the fence with the Dado in the horizontal position. (See Figure 140.)

Note: Some saws have a one piece backboard. If this is the case with your saw then:

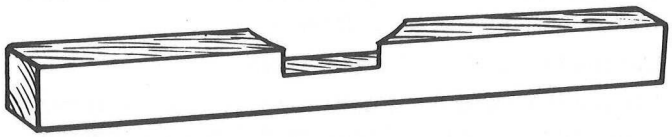


Figure 140

Remove the narrow spacer board in back of the fence and push the wide one all the way back with its cut-out facing forward.

Place two pieces of scrap, the same width as the narrow spacer board, in front of the wide spacer board on each side of the cut-out and clamp the fence in place. (See Figure 141.)

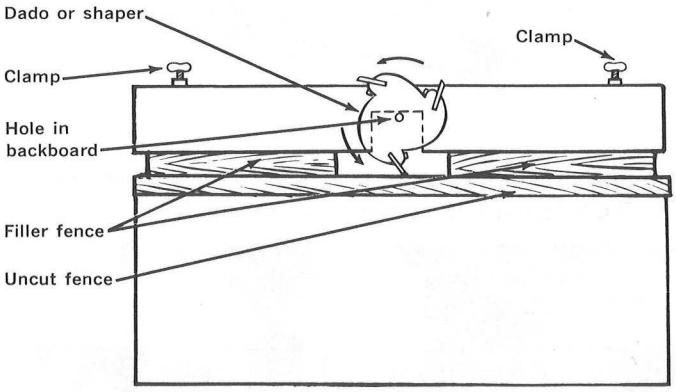


Figure 141

The two pieces of scrap will elongate the hole so the Dado can be lowered in back of the fence to any depth you wish, without the arbor, arbor-nut or washers hitting the spacer boards.

Turn the saw on and draw it forward cutting through the fence the distance you wish.

Always cut through the fence slightly deeper and wider than the desired cut. (This gives the blade clearance from the fence. Hence no binding and more power.)

The depth of a rabbet, tongue or groove can be measured by using the rip scale and counting the number of turns on the handle. (Each turn is ⅛".)

Blind grooves with the Dado.

Note: Blind grooves with the dado cannot be made on very short distances satisfactorily due to the curvature of the blade. In all cases, short or long, the ends will be curved the same diameter as the blade. If you wish the grooves to be square they must be chiselled out by hand. The router will help remove some of the stock but even the router will leave a rounded corner that must be chiselled out. (See Figure 142.)

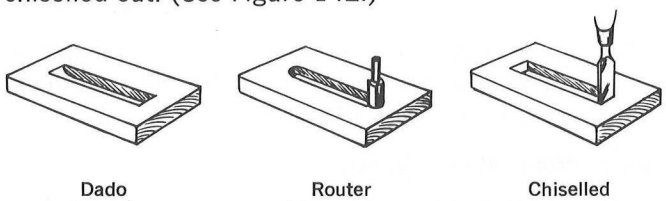


Figure 142

Blind grooves on the surface—cross cut:

Place the lumber so the Dado head is directly above the desired spot to be grooved on the lumber.

Clamp the lumber down.

Turn the saw on.

Hold the handle in your left hand and lower the arm with your right hand.

When the Dado just strikes the surface, start counting the number of turns of the elevating handle for the desired depth. Each turn is ⅛". (The Dado may start to climb, so hold tight with the left hand or tighten the rip lock to put a drag on the roller head.)

Pull the Dado head forward the desired distance and shut off the saw.

Elevate the arm and remove the stock.

If repeated blind grooves are to be made, clamp two small pieces of stock inside the track so the roller head can go back and forth the desired distance. (See Figure 143.)

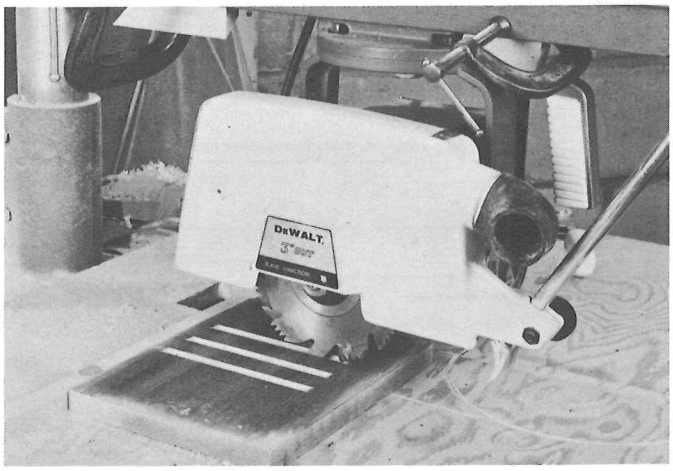


Figure 143

Blind dado length controlled by two pieces of scrap clamped to the arm. See text.

Blind grooves on the surface—rip (in-rip position).

Locate the Dado head the desired distance from the fence.

Locate the lumber where desired.

Nail or clamp a stop at the end you will push from. (Right side "In-Rip; Left side "Out-Rip.")

Lower the blade (motor off) until it is slightly above the surface of the lumber.

Lower the guard until it is above the lumber about ⅛" higher than the depth of the Dado you are going to cut. Lower the anti-kickback this same distance (if the groove starts near the end of the lumber and the anti-kickback does not strike the lumber as the Dado is lowered into the lumber, lower it ⅛" lower than the Dado depth).

Turn the saw on and lower the Dado until it just strikes the surface. Continue lowering, counting the turns from the time it strikes until the desired depth is reached.

Push the lumber the desired distance cutting the groove with a feed cut.

A stop on the other end will limit the length of the groove and can be used for repeated operations. (See Figure 144.)

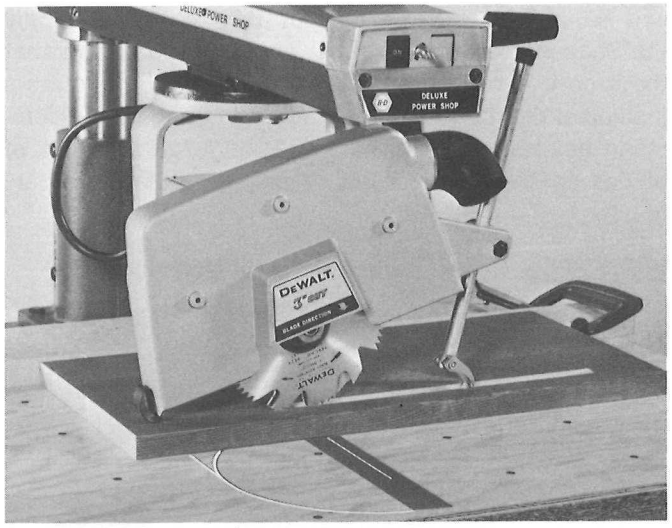


Figure 144

Blind ploughs length controlled by stop clamped to fence.

Blind grooves on the edge or end.

Note: Any time your saw is in a horizontal position it is suggested from a safety point of view that you use a special type of guard called a "tool guard." This guard will accommodate any cutting tool 8" or less in diameter. It can be used with the Dado, Shaper, Sander and others.

Set the Dado at the desired height and depth through the fence while it is in a horizontal position.

Place the lumber, to be cut, in its desired position and clamp or nail a stop on the fence at the right end. (Extend the fence if necessary.)

With the right end of the lumber against the stop, the saw on, push the lumber into the Dado until it is flush against the fence.

Push the lumber from right to left the desired distance. A stop on the left side will limit the distance of the groove for repeated operations. (See Figure 145.)

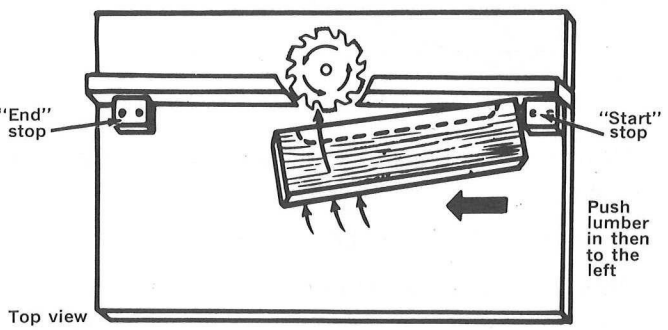


Figure 145

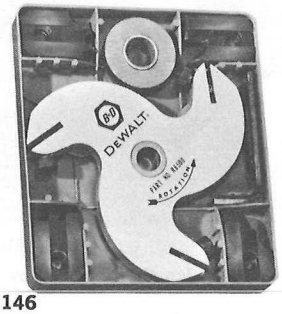
SHAPING

Shaper-Jointer Fence: Before attempting to install this accessory, refer to instructions provided.

Shaper Tools. (Included in this section will be Jointing, Shaping, Planing, Moulding, Surfacing, Panel-Raising and Rabbeting as performed by the Shaper. Basically the Shaper operates the same as the Dado except that the groove it makes will have the shape of the cutters instead of the flatness of the Dado. The Shaper we recommend has removable blades and the large selection of blades enable the operator to perform a large variety of cuts.

SAFETY TIP Never shape without the guard in place.

This is the recommended shaper and the one that performs the operations discussed in this chapter.



3 Knife Shaper Head

Figure 146

BEFORE USING THIS ACCESSORY, REFER TO INSTRUCTIONS PROVIDED.

The cutters (for best results) should be removed after each time they are used—clean, sharpen and wrap in waxed paper for storage.

Sharpen all cutters by placing them on a flat (fine) oil stone and revolving them in a circular motion. (See Figure 147.)

If the cutting edge is burned, nicked or chipped it must be reground professionally.

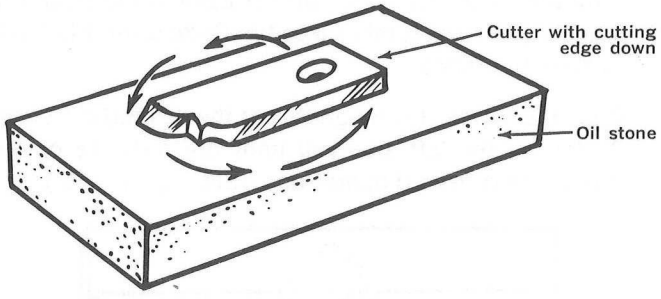


Figure 147

Paint, varnish, oil, glue, dirt, etc., will burn the cutter instantly.

Nails will chip or nick the edge.

Never try to sharpen cutters on the raked edge or on the face with a power grinder. Professional grinding equipment is needed to do this operation.

The hand plane is a tool used to cut a small amount off the edge of a piece of lumber. (See Figure 148.)

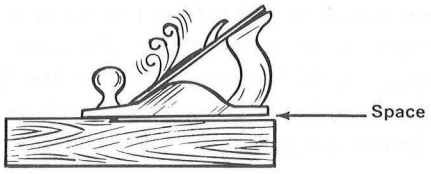


Figure 148

However, it requires skill, time, muscle and sometimes a waste of lumber to get a perfect, straight edge with a hand plane. This is due to the human element and the fact that on most hand planes the shoe is not split so that the rear half will rest evenly on the section of lumber just cut away by the blade. (See Figure 148.)

Power Planes (portable as well as fixed). The above problem is solved by splitting the shoe or bed and setting up guides to keep the lumber square to the cutter. (See Figure 149.)

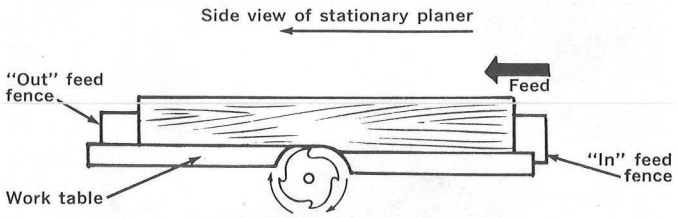


Figure 149

If you turn illustration Figure 149 up-side down you can see that the portable planer is basically the same as the fixed planer, only smaller.

Portable Planes generally have cutters 2″ long.

Fixed planer cutters are 4″, 6″, 8″, 10″, 12″ and even longer. The most commonly used in home and industry are the 4″ and 6″.

Figure 150 is Figure 149 turned up-side down. By substituting a few names you will see how we can convert the radial arm saw to a planer with a 2″ capacity.

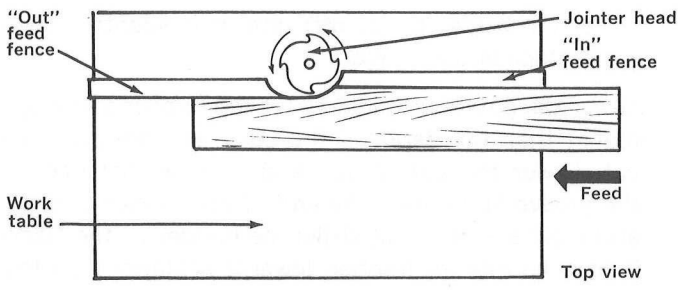


Figure 150

Edge planing:

Position the Knives so they are just in back of the work table and the bottom side of the Knives is slightly be-

low the ¼" ply laminate on the work table. (See Figure 151.)

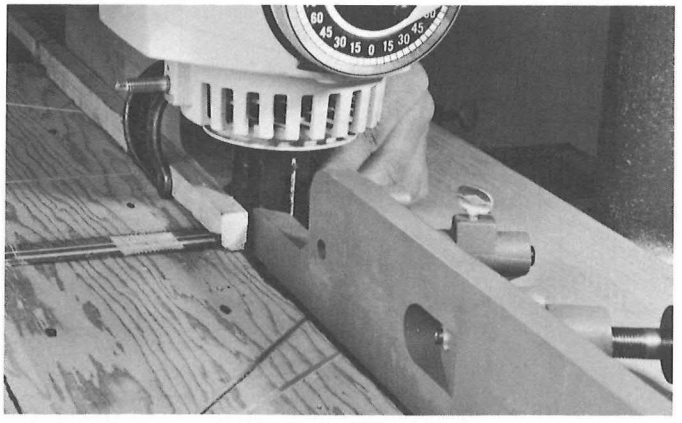


Figure 151

Adjust the jointer knives so they are even with the left hand wood fence.

Insert the Jointer Fence and tighten it.

Place a straight piece of scrap against the left fence and position the roller head so the cutting edge of the blades is even with this piece of scrap. (This is a very fine adjustment.) When the cutters are as even as you can make them, lock the roller head with the rip lock.

Set the right hand fence for the size bite you wish to plane off. (No more than 1/16".)

Place the Shaper Guard on the motor and adjust to the thickness of the lumber to be cut.

With a piece of scrap, take a pass to see if the cutters are adjusted correctly.

If the piece of scrap hits the left hand fence the cutters are too far back. (See Figure 152.)

If the scrap does not hit the left hand fence continue about 3" of cut and see if the lumber just cut is resting

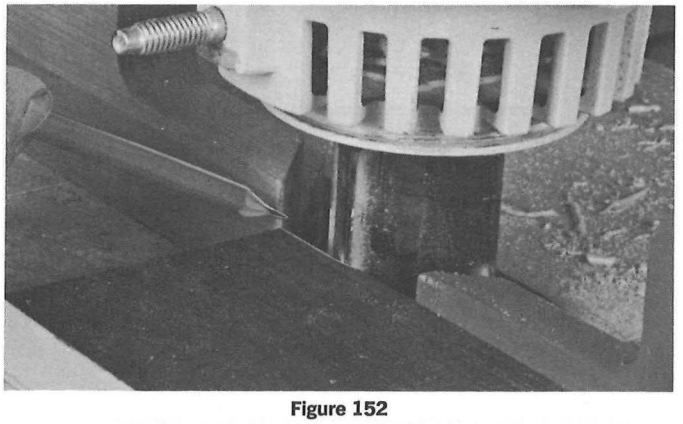


Figure 152

If cutter is too far back piece to be joined will strike the left hand wood fence. Guard has been removed for photographic purposes only.

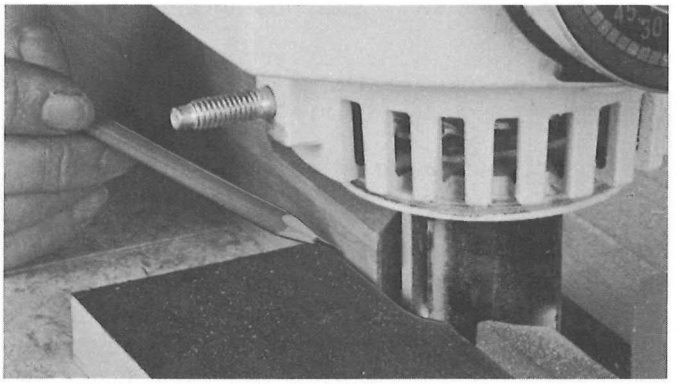


Figure 153

If cutter is too far out, a space will appear between the cut and the left hand wood fence. The guard has been removed for photographic purposes only.

on the fence or if there is a space between the left hand fence and the piece of lumber. If there is a space (even very little) the cutters are too far out. (See Figure 153.)

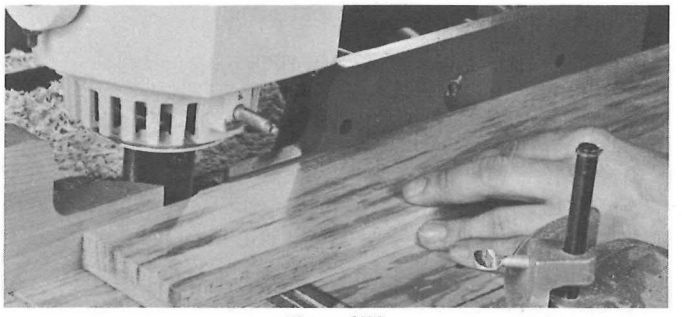


Figure 154

With cutter set properly perfect jointing is possible on your DeWalt. Shaper guard has been removed for photographic purposes only.

To adjust the cutters, loosen the rip lock and move the roller head into the proper position (usually very little).

Figure 155

Take another pass with the scrap. If the edge is straight for the entire length, the cutters are adjusted correctly. If you find a slight recess at the right end of the lumber

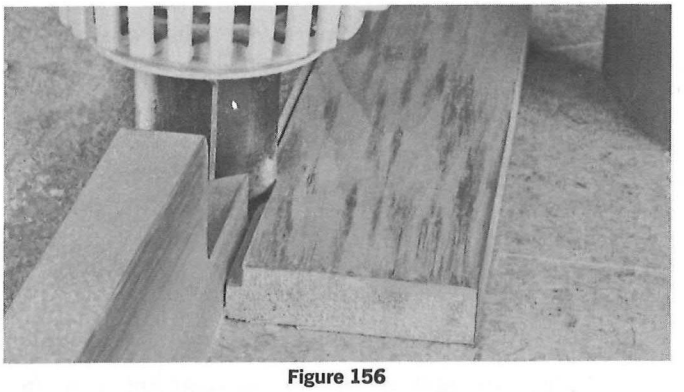


Figure 156

By elevating the jointer head and adjusting the right metal fence to be even with the left hand fence, rabbets can be made with the jointer head. Guard has been removed for photographic purposes only.

the cutters are still slightly too far out. (See Figure 155.)

You are now set up to plane the edge of a piece of lumber up to 1⅞" thick.

The Joint Head can be set to rabbet an edge also.

The manipulations in jointing a board or planing a board are identical. The only difference is in the purpose of the cut. The planer is basically used to change the size of the lumber. The jointer is basically used to put a smooth straight edge on a piece of lumber so it may be glued to another piece with the junction being unnoticeable as much as possible. Hence the word "Jointer." When jointing a board, we take off as little wood as possible for cleaner cuts and less waste. The reasons for jointing are quite varied, important and interesting.

To create a large area of wood.

To select colors and grain patterns.

To eliminate defects and knots in woods.

To make contrasting colors and assemblies of different woods.

Most important, to eliminate the warps and future warps in wood. For example, if you had a piece of wood about 2' x 3' and this was just the size you wanted, the proper procedure to follow for good furniture construction would be as follows:

Rip the wood into thin sections 2" to 4" wide. (See Figure 157.)

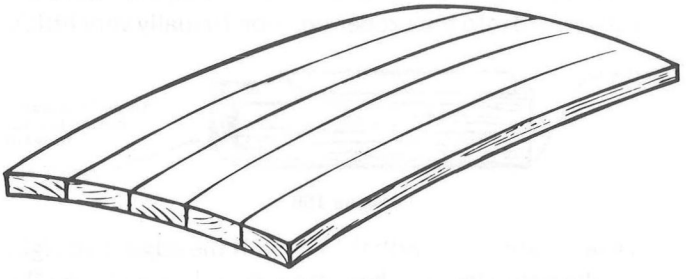


Figure 157

Joint each section.

Glue them back, turning every other one upside down. This will even out the warp. (See Figure 158.)

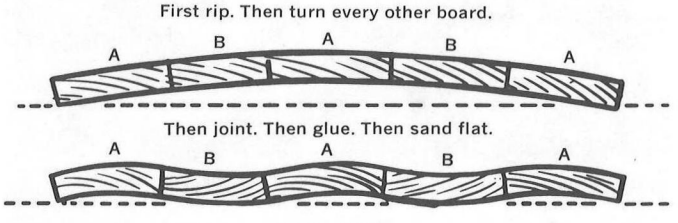


Figure 158

The bow on each piece will be equal but opposite. The stresses on each will counteract each other and keep the board straight. (See Figure 159.)

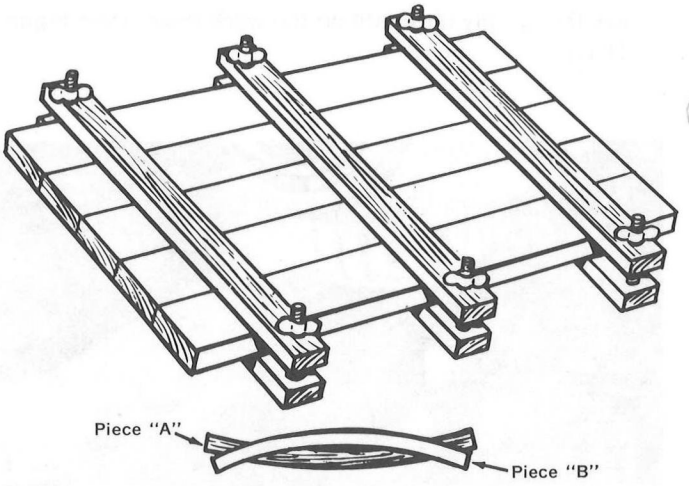


Figure 159

The finished piece is then surfaced to make the joint even and then sanded to the desired finish.

If a board is twisted or bowed, it is difficult to joint a straight edge on it. Saw off the bad edge first and then joint it.

How to make your own Jointer fence.

Cut two pieces of lumber 2" x 15" x ¾" and glue a thin shim ¾" wide on the 2" side of each piece. (See Figure 160.)

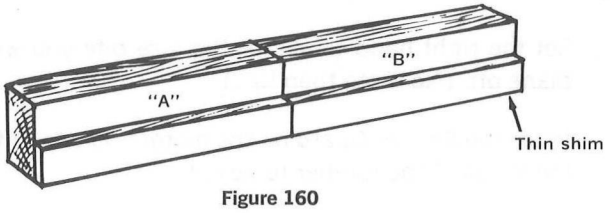


Figure 160

The shim can be wood, cardboard, metal or any uniform thickness material. This shim will be the size of the bite. (See Figure 161.)

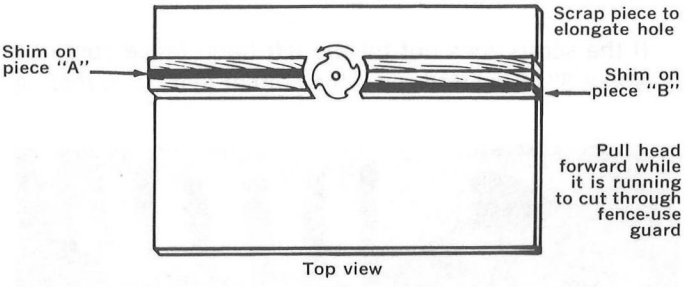


Figure 161

Turn piece "A" around so the shim is in the back and clamp "A" and "B" in place of the regular fence. (See Figure 161 on page 48.)

Draw the cutter through so the blades are even with the left hand side, piece "A", as in the regular jointer fence.

Another jointer fence can be made as follows:

Rip a thin kerf on the front right side ¾" from the

bottom of a piece of lumber 2" x 31" x ¾" and use it as a jointer fence. (See Figure 162.)

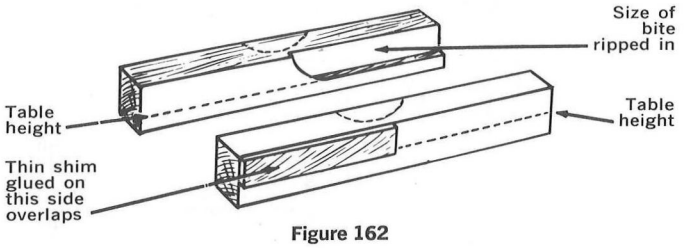


Figure 162

Space and parallel Jointing. If you wish, you can joint an edge by setting up a fence on the opposite side of the cutter and running the lumber between this fence and the cutter. (See Figure 163.)

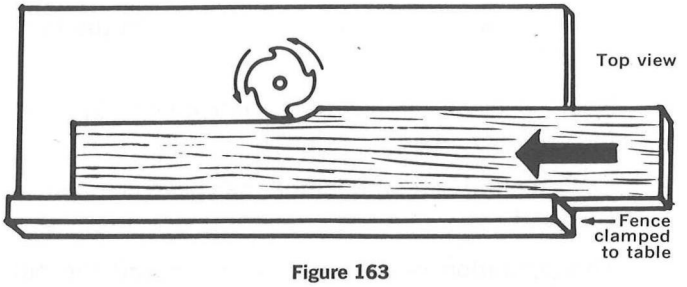


Figure 163

This operation forces the lumber to have parallel sides once it is cut, even if it has been tapered previously.

If two or more boards are passed between the fence and the cutter they will all come out the same width, even if they varied slightly before.

You must push the lumber from right to left and at the same time **out** against the fence.

This operation is performed with the lumber between a revolving cutter and a fixed fence. This can be dangerous. So take small bites. Use a firm grip on the lumber. Never let go of the lumber while it is being cut.

The bottom of the knives must be slightly below the bottom of the lumber that is being jointed.

This can be done by elevating the lumber (to be jointed) with ¼" scrap ply or masonite. (See Figure 164.)

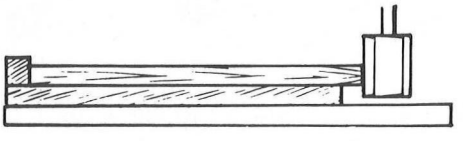


Figure 164

SAFETY TIP **Never use the above method without the shaper guard on.**

A satisfactory jig can be made so the cutter will go below the surface and the elevating scrap is eliminated. (See Figure 165.)

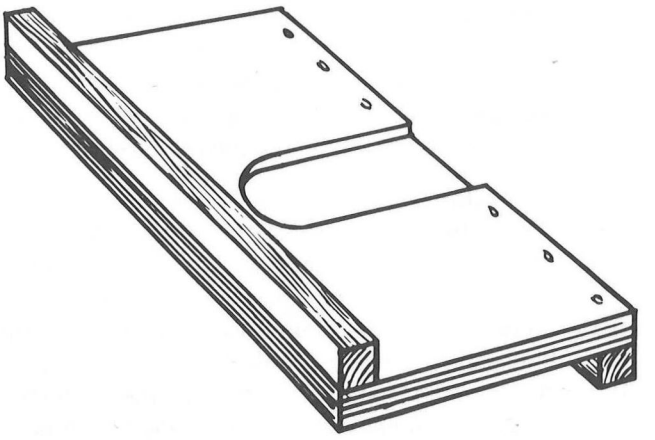


Figure 165

SAFETY TIP The Shaper Guard must be used for any operations just described.

When jointing thin boards or long boards with this method, two feather boards are needed to hold the lumber against the fence. (See Figure 166.)

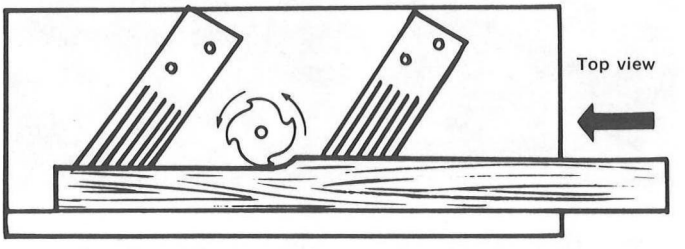


Figure 166

This same method can be used to make moulding. (See later section.)

General information on Jointing and Shaping.

The smoothness of cut depends on the number of cuts per any given distance.

If you feed the stock slowly you will get more cuts per any given distance.

The cleanness of the cut depends on the sharpness of the cutters and the tip speed.

As the diameter of the cutter increases, the tip speed increases tremendously. A 6" cutter at 3400 rpm has a faster tip speed than a ½" cutter at 18,000 rpm.

You **cannot** use ½" straight edge router bits at 3400 rpm for Jointing. Tip speed is too slow.

SURFACING

Mounting Rotary Surfacer. This attachment will quickly and efficiently cut warped boards down to uniform thickness and convert them into usable stock ready for sanding or finishing. To install the rotary surfacer, remove all items from the motor shaft. Screw on the rotary surfacer directly to the motor shaft. Tilt the

motor to the vertical position (the surfacer will be in a horizontal position), adjust the motor on the arm where the surfacing is to be done, lock the rip clamp, and lower the column until the surfacer knives project slightly below the top surface of the material.

To use the rotary surfacer for this operation, place the stock flat on the table against the fence and feed the work into the rotary surfacer from right to left, following the grain. For wide pieces, make successive cuts at the same depth setting; move the motor on the arm. Keep the work flat on the table to prevent gouging. When the top side is surfaced flat, turn the piece over and surface it parallel with the first side. Plane bevel edges by setting the motor at the desired angle.

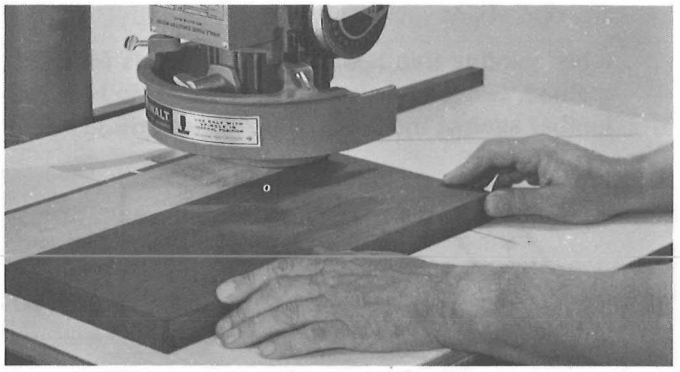


Figure 167

This form of surfacing is called rotary surfacing and you will be left with circular lines on the surface after the operation above. However, if your saw is in good alignment, the cutters sharp, the bite small and your feed slow, you can get good enough results so that hand sanding will be all that is necessary to assure a good finish.

Rotary surfacing is basically used to reduce the thickness of a piece of lumber.

Surfacing a jointed board.

No matter how well you glue up a jointed section of lumber you will be left with some amount of unevenness.

This jointed section can be surfaced the same as a solid board. The only problem is the glue. The glue will dull the blades very quickly. To minimize this problem remove as much excess glue as you can before you start to surface.

Cross-feeding a surface.

All the surfacing cuts, so far described, are feed-cuts. You can surface a piece of lumber by drawing the surfacer across the lumber. Proceed as follows:

Start with the lumber on the right side of the surfacer and against the fence.

With the right half of the surfacer ($1\frac{1}{2}$" engaged into the lumber, no more than $\frac{1}{16}$", draw the surfacer forward climb cutting as you do so.

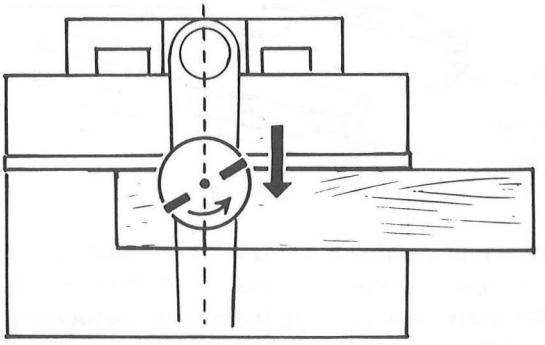


Figure 168

The rotation of the surfacer will help hold the lumber against the fence.

Now move the lumber to the left about $1\frac{1}{2}$" and take another pass.

Continue this until the lumber has been completely surfaced.

This operation is cutting cross-grain and the cut may not be as clean as a cut with the grain. Use this method on long boards.

Panel-Raising with the Surfacer.

The beveled edge on the bottom of the knives enables you to panel-raise a piece of lumber. (This bevel is the edge that takes the brunt of the rotary surfacing. The bottom edge does little work. It is even raked back at less than 90° for clearance.) (See Figure 169.)

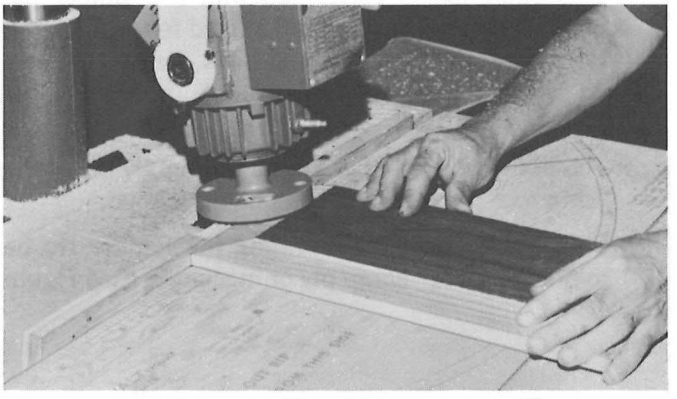


Figure 169

Panel Raising is identical to surfacing except:

We only cut in the desired distance.

We set the bevel angle as desired to raise the panel.

Panel-Raising can also be done with the saw blade or the Dado but the results from the knives are better because the pitch on the shoulder is out instead of 90° to the cut. (See Figure 170.)

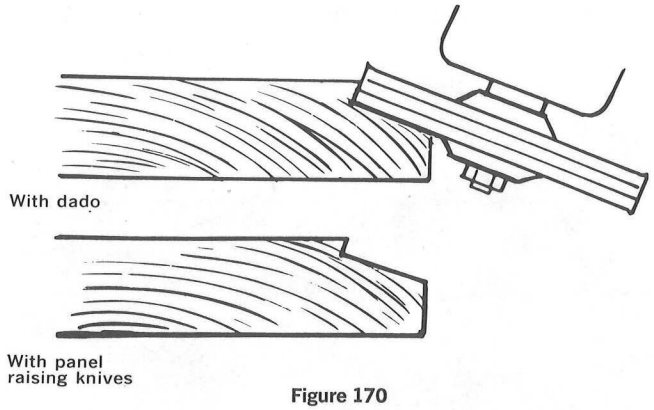


Figure 170

When panel-raising a solid board, four sides, do the cross-grain ends first and with the grain last.

Sometimes the cross-grain cut splinters at the end of the cut. This can be kept to a minimum by backing the cut with a piece of scrap. (See Figure 171.)

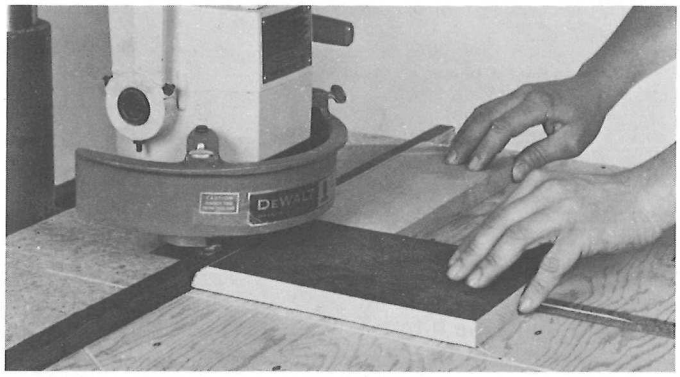


Figure 171

When shaping, dadoing or panel raising edge grain use a back-up piece as shown to eliminate splintering.

If you are going to panel-raise a piece of plywood, four sides, each cut must be backed.

If you wish to frame a panelled piece of lumber you can wedge it in a groove or rabbet it (there are other methods also). (See Figure 172.)

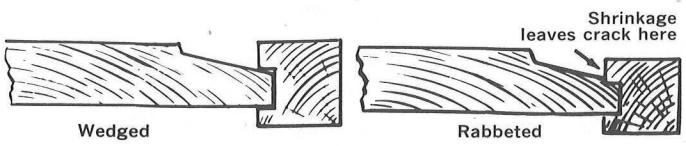


Figure 172

Other cutters that behave similarly to the Jointing Knives.

Any cutter that takes off the entire edge of the lumber **can** be used with a split fence. This is not **necessary** (except with the glue-joint knives which are used the same way as Jointing Knives).

The Cabinet Door Lip (See Figure 173). This cutter has a 7° rake on the rabbet for wedge cutting, clearance and to fit standard hinges.

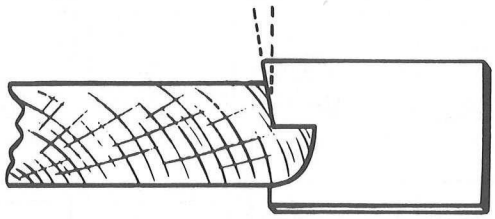


Figure 173

When using these cutters on plywood, four sides around, start the first cut in the middle of one side and back each cut with a piece of scrap.

Nosing Knives (See Figure 174).

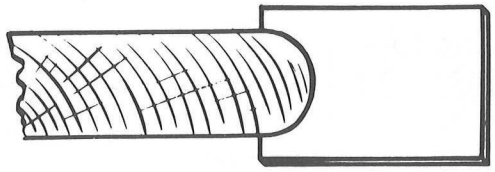


Figure 174

If these knives are used so the deepest part of the knife just grazes the edge of the lumber, a regular fence can be used. (See Figure 175.)

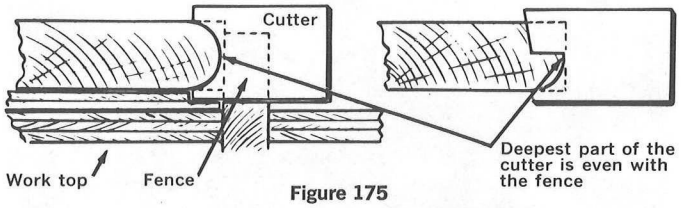


Figure 175

If you wish to cut off a little of the edge, to insure a cleaner cut, then the split fence is required. (See Figure 176.)

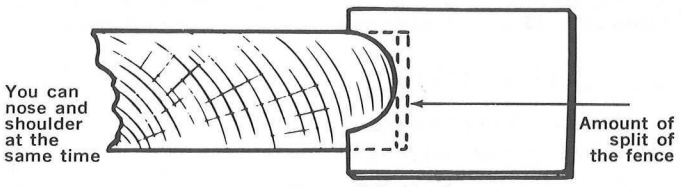


Figure 176

The Bead and Cove Cutters. These cutters are the most popular because they can make a large variety of cuts and are generally used with a regular fence. (See Figure 177.)

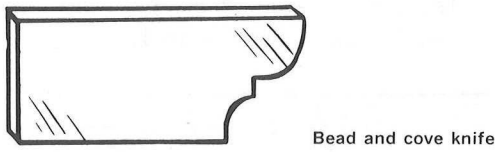


Figure 177

With the cutter horizontal you can engage it into the lumber to make a variety of cuts. (See Figure 178.)

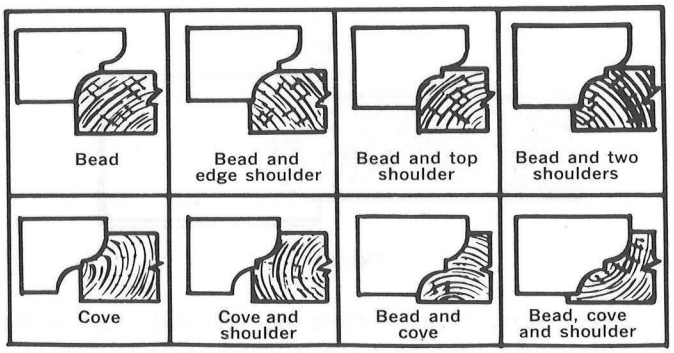


Figure 178

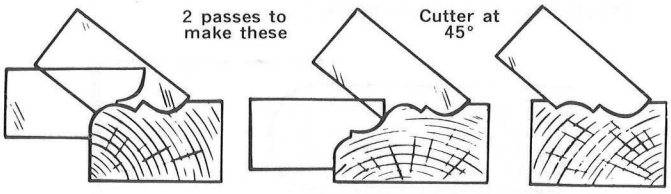


Figure 179

Other designs can be made by positioning the cutters as you desire.

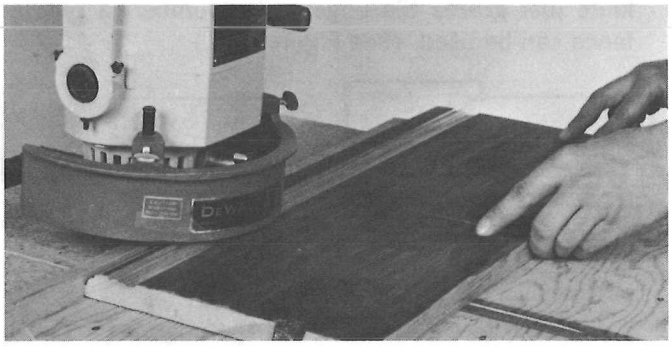


Figure 180

The bead and cove knives shaping the edge of the lumber forming a bead with two shoulders. The upper cut was made with the bead and cove knives set at 45° bevel position using the regular saw blade guard.

Glue-Joint Knives (See Figure 181).

These cutters are used the same way as, and sometimes in place of, the Jointing Knives.

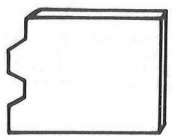
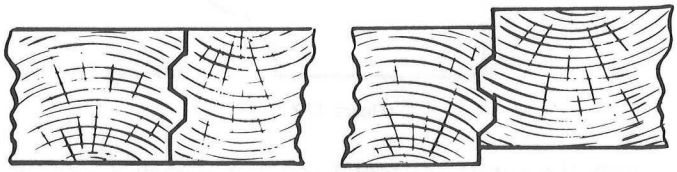


Figure 181

One advantage is a longer glue line.

The boards you use must be flat and the cutters adjusted so the center of the knives is in the center of the boards.

The male and female are both the same except one is upside down. (See Figure 182.)



Correct Incorrect

Figure 182

All shaper knives that fit under the regular saw guard can be used as Moulding Knives. (See Figure 183.)

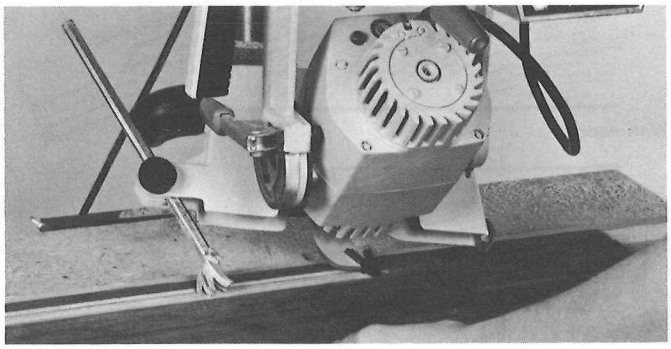


Figure 183

Top-side moulding cuts can be made in the rip or cross-cut position provided that the shaper knives fit under the saw blade guard.

The basic difference between Shaping and Moulding.

In Shaping the depth of cut is controlled by a fence, a ring or a pilot. The lumber is always free to move away from the cutter. (See Figure 184.)

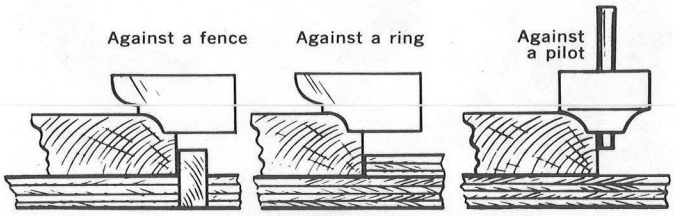


Figure 184

In Moulding the lumber moves between the revolving cutter and a fixed fence or table. The distance between the shape and its opposite side is always the same for each individual set up. (See Figure 185.)

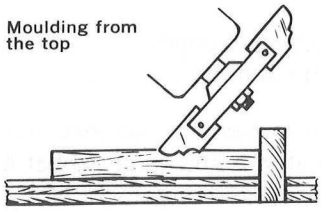


Figure 185

Moulding operations must always be done under a guard and precaution must be taken to be sure the lumber does not work its way away from its fence or table and into the cutter. When performing moulding operations note the following:

SAFETY TIP Hold-downs, a firm grip, clamps and pushers with lips on them, are necessary.

Thin, flexible stock should not be moulded unless straddle boards are placed on one or both sides of the cutter. Remember, all feed-cuts have a tendency to lift the lumber into the cutter.

All moulding operations are executed the same way as if you were operating a Dado Head. This refers

to the blind and drop-cuts as well. (See section on Dados.)

Shaping on irregular edges.

Any concave or convex curve can be Shaped providing the arc of the concave section is as large or larger than the arc of the Shaper. (See Figure 186.)

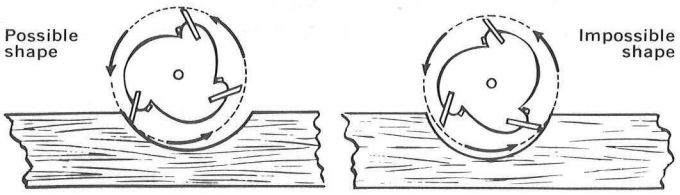


Figure 186

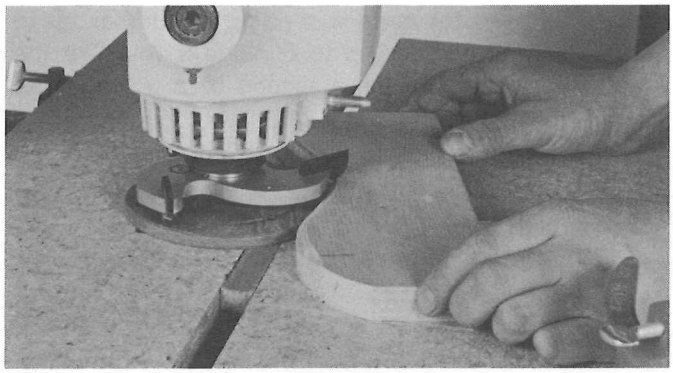


Figure 187

Shaping a curved piece of wood using a wooden shaper ring. The guard has been removed for photographic purposes only.

In order to Shape an irregular edge you must construct a Shaper Ring. (See Figure 188.)

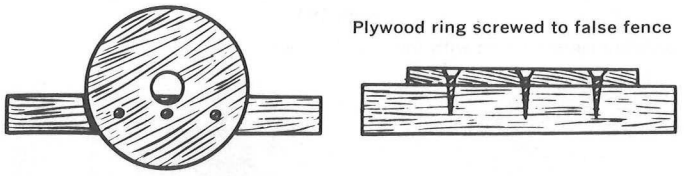


Figure 188

The Ring is cut from ¼" plywood and then glued and screwed onto the false fence. Nails alone are dangerous because pressure on the Ring may pull them out.

(The diameter of the Ring depends on the diameter of the Shaper and what part of the Knives you wish to engage into the lumber. (See Figure 189.)

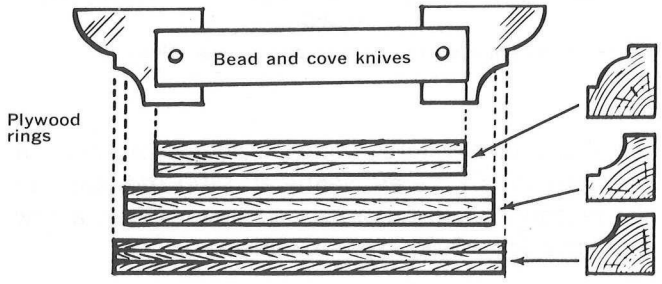


Figure 189

In any operation where the entire edge is to be Shaped the lumber cannot be guided on the edge of the Ring. A template must be cut and attached to the lumber to be cut and the template must be held against the Ring. (See Figure 190.)

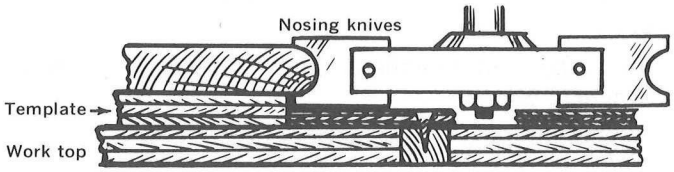


Figure 190

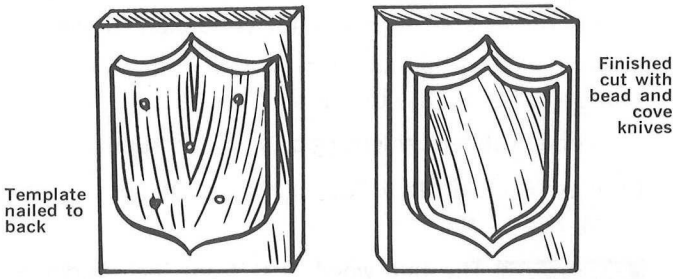


Figure 191

If the template is cut to a different shape from the piece to which it is attached, the completed shape will be that of the template. (See Figure 191.)

Unusual Shapes.

If the lumber is clamped down and the Shaper engaged into its surface, circular moulding can be carved by rotating the yoke assembly while the cutter is revolving.

Arcs can be carved by moving the arm while the Shaper is in the "In-Rip" or "Out-Rip" position.

Cross-grain mouldings can be cut by drawing the roller head forward (same as Dado). Some of the cross-grain cuts can make interesting mouldings. (See Figure 192.)

The above are the same as castellated mouldings with the Dado. (See section on the Dado.)

Thousands of variations can be made with a combination of changes in cutters, the bevel angle, the spacing, the depth, the miter angle, the width of the ripped piece and the angle of the rip. The complete story on Shaping can fill many volumes of books.

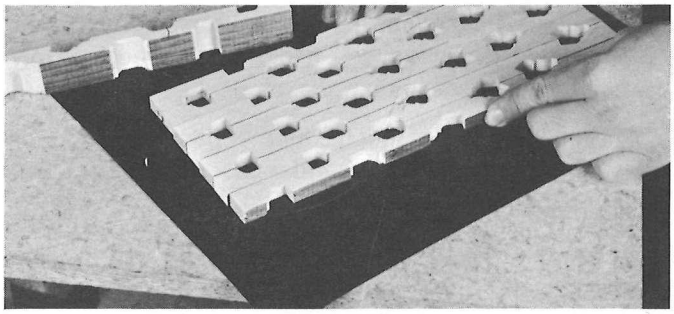


Figure 192

SAFETY TIP **Remember, never shape or mould without a guard.**

The Sanding Disc.

The sanding disc is 8″ in diameter and has a slight bevel on its edge to make surface sanding a little easier.

The paper can be adhered to the disc in one of four practical ways.

Self-adhering paper—easy to use.

Disc Stick—a tacky substance, very widely used. Safe as long as you don't get the disc too hot. The paper will fly off when the disc-stick melts. It is very reasonable in price. Quick and easy to use.

Special Tape that adheres on both sides. Safe, not too available. Easy to use.

Special rubber cement (glop by Carborundum).

Only use Cabinet-Back Paper (heavy). Do not use Finishing Paper (too thin).

SAFETY TIP **The fine wood dust from the sander is explosive when it is about 70% dust and 30% air. Do not smoke or work near open flame with the sanding disc.**

The dust from most woods when inhaled will cause choking. Wear a dust-mask or a surgical mask while sanding. (Some woods that cause choking are oak, ash, spruce, cherry, mahogany, fire-proofed lumber.)

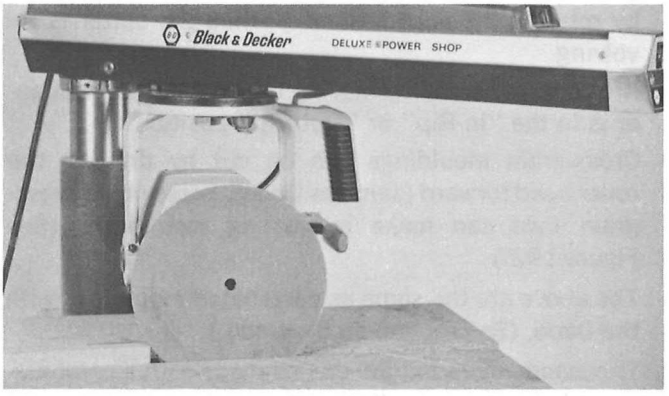


Figure 193

In order to lower the sanding disc below the front table surface, miter the arm to the right (as shown) or to the left so that the motor does not hit the post. Position and lock the yoke so the sanding disc is parallel to the fence.

SAFETY TIP Do not strike the sanding disc with your hand while it is revolving. Hold small pieces firmly when free-hand sanding them.

You can sand by passing the lumber past the sander or by pulling or pushing the sander past the lumber. (See Figure 193.)

Drum Sander. This sander is designed to sand inside curves; however, it is very good for sanding any edge: inside, straight or outside.

The late model drums take strip paper that can be cut from regular cabinet-back sandpaper.

The paper is held in place by flattened metal tube that is turned with a screwdriver to lock the paper (or with a key supplied with the sander).

It can be used for straight edge sanding in the same manner that the Jointer is used except we do not use a Jointer Fence.

Because it is rubber backed, under the paper, you must use even passes against it or indentations will appear in the lumber wherever you hesitated in the pass.

It can be used for surface sanding on lumber up to 3″ wide or on lumber up to 6″ wide if you turn the lumber around and take a second pass. (See Figure 195.)

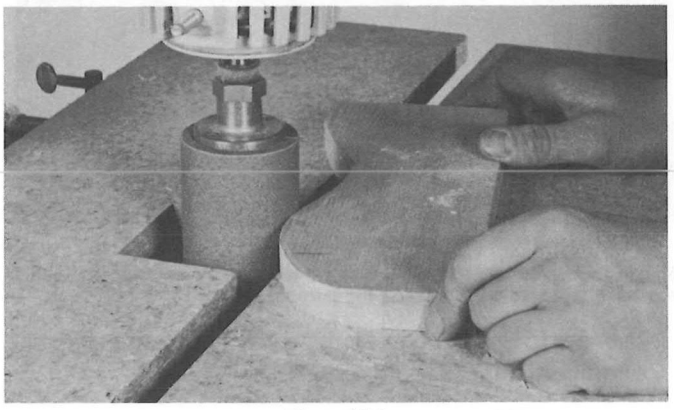


Figure 194

Sanding curved edges with the drum sander.

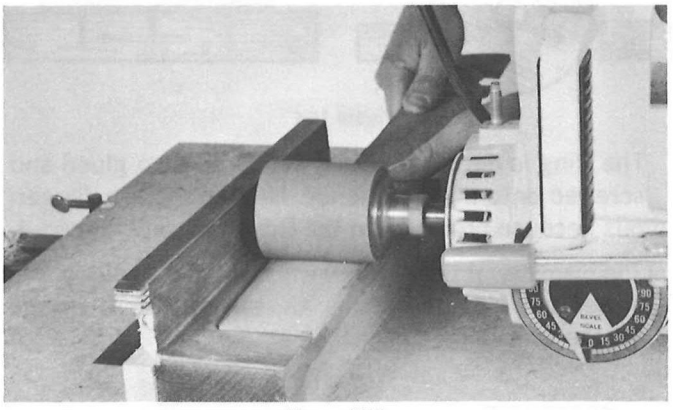


Figure 195

Sanding surface of lumber with drum sander and elevating jig.

Routing.

Small diameter routers (¼″ to 2″) do not have enough tip-speed to operate efficiently at 3400 rpm and are not recommended for radial arm saws. (Even a saw that goes up to 7,000 rpm is too slow.)

If you do use router bits or small shaper bits you must take small cuts and feed the stock slowly.

If you are making a groove with the router-bit using the fence as a guide be sure to feed in a direction so the cutting action of the bit pushes the lumber against the fence. (See Figure 196.)

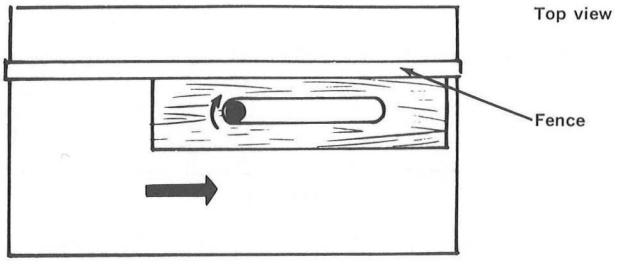


Figure 196

If you are making a blind mortise with the bit in a horizontal position be sure you feed in a direction so the cutting action of the bit pushes the lumber down. (See Figure 197.)

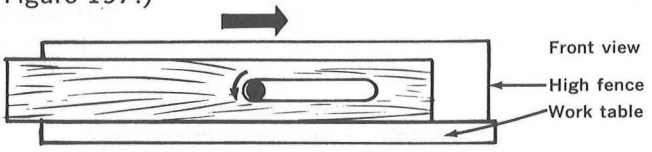


Figure 197

If you own a portable router you can purchase an adaptor that will hold your router firmly next to the motor and you will have a radial arm router. Any other method, at this time, is not recommended as satisfactory.

Grinding, Buffing and Wire Wheels. All these operations are excellent and easy to perform on your radial arm saw. The precautions you must take are as follows:

SAFETY TIP Wear safety glasses.

Be sure the stone, brush or buffer is rated to revolve at 3400 rpm without flying apart.

When grinding or sharpening iron or steel watch out for sparks. They can start fires.

Jig-Saw.

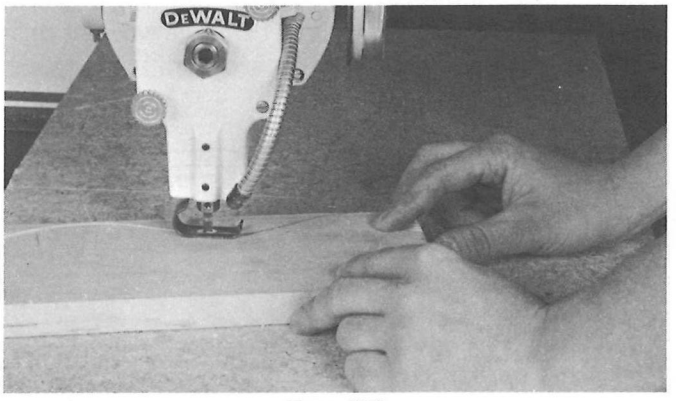


Figure 198

The saber saw on the DeWalt will cut 2" deep. Lower the saber saw until the spring rests firmly on the surface of the material to be cut. There are blades available for cutting metals as well as wood. Be sure to follow the instructions that come with the saber saw.

Chapter 9
Special Cuts

Kerfing or Bending Wood:

If you rip a piece of wood thin enough it will bend quite easily.

Wet this piece and it will bend even more easily and have less tendency to crack.

By cutting a slit cross-grain and leaving a thin piece of wood on the bottom you can bend the wood at this cut until the slit or kerf is closed at the top. (See Figure 199.)

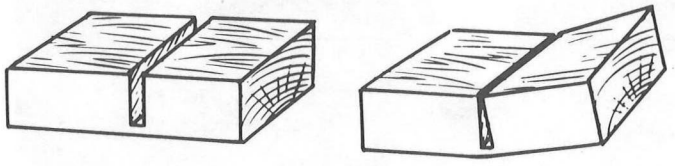


Figure 199

By cutting several slits, one alongside the other, the piece will appear to bend. (See Figure 200.)

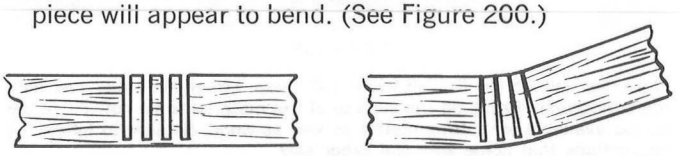


Figure 200

You can determine the number of slits it takes to bend the lumber 90° by measuring the angle of the first bend and dividing this angle into 90°. An easier method is by trial and error on a piece of scrap of the same thickness.

Once you determine the number of cuts you will always get a bend of 90° regardless of the distance between the cuts. The wider the cuts are spaced, the bigger the arc. (See Figure 201.)

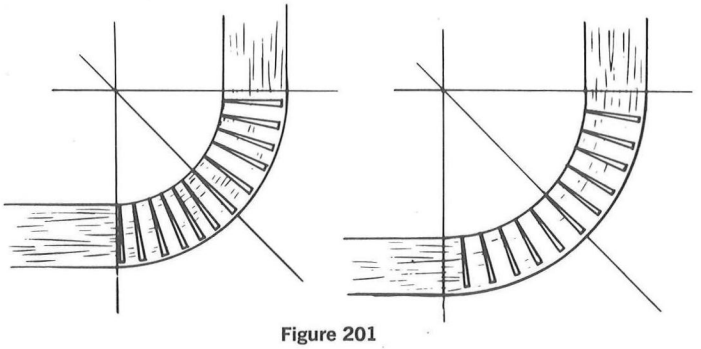


Figure 201

When the kerf cuts get wider than ¼" apart the effect of the curve changes to straight sections at an angle to each other. (See Figure 201 above.)

If wide arcs are desired the number of kerf cuts needed can be increased by one of two methods or by a combination of both.

Use a blade with a thinner kerf. (See Figure 202.)

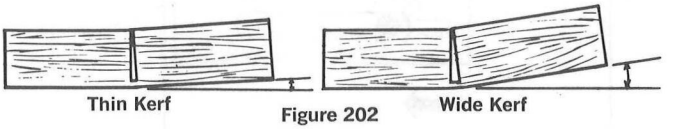


Figure 202

Use a thicker piece of lumber. (See Figure 203.)

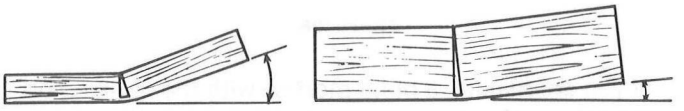


Figure 203

Glue an extra piece of lumber to the back of the section to be kerfed. By doing this you can artificially increase the thickness of the lumber only at the place you want it. (See Figure 204.)

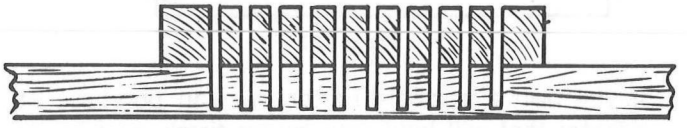


Figure 204

The piece to be curved can be mitered, rabbetted or grooved or even shaped on the inside or edge but this must be done **before** you kerf it. (See Figure 205.)

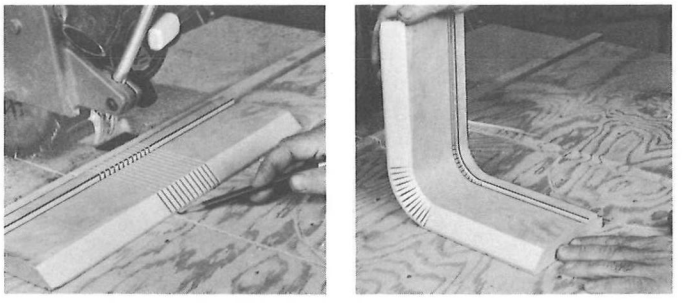


Figure 205

Piece to be bent has rabbet, groove or chamfer cut first. Kerfing operation is last. Notice pencil line on table used to index spacing.

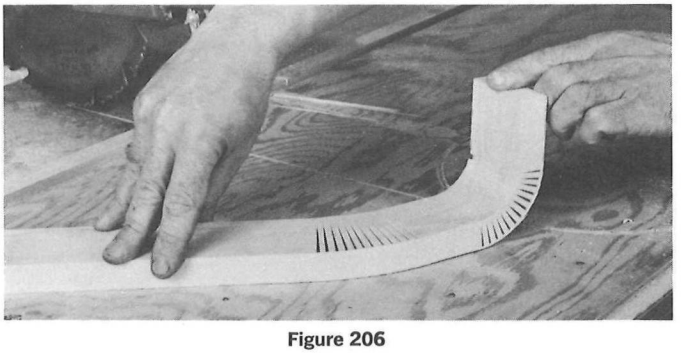


Figure 206

Same number of cuts made through ¾" thickness and 2" thickness. ¾" section bends 90° and 2" section bends very little.

Once the piece is bent, the holes from the kerf cuts are filled with saw-dust and glue forming a solid, curved piece of lumber when the glue has hardened.

All sides of the curved piece can be veneered to give a smooth solid appearance.

If the cuts are made at an angle the piece of lumber will spiral and the pitch of the spiral will be the same as the angle you cut. (See Figures 207 and 208.)

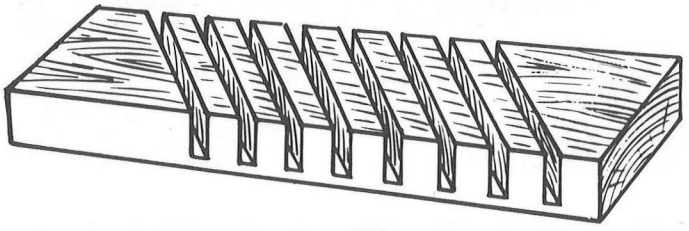


Figure 207

CUTTING CIRCLES:

Circles are generally cut with a saber or jig-saw, but they can be cut with the saw blade.

There are several methods: the first two methods will give you the hole and the disc; the third method will give the disc only.

1st method:

Clamp the stock down so the center of the circle is directly under the saw arbor when it is in a vertical position.

Lock the rip-lock. Set the saw blade 90° to the table in the cross-cut position.

With the motor on, lower the blade until it just strikes the lumber.

Insert a small wedge under the yoke locator pin to keep it down. With the left hand on the anti-kickback rod, release the yoke lock with the right hand, put the right hand on the handle and rotate the yoke, clockwise, one complete turn. Return it to its original position. (See figure 210.)

Lower the blade 1/16" (1/2 turn of the elevating handle) and repeat the operation.

Continue this, lowering the blade 1/16" at a time, until the disc is **almost** cut out. (If you cut it completely out, when it is loose, it may slip under the blade with serious results.)

On the last cut leave part of the cut holding the disc and then break it out or cut it out with a knife. If the disc is nailed to the table you can cut it completely through.

The disc will have straight sides but the hole will have a bevelled side due to the curvature of the blade. (See Figures 209, 210 and 211.)

A smaller hole and disc can be cut by bevelling the blade so its radius is smaller as it is rotated.

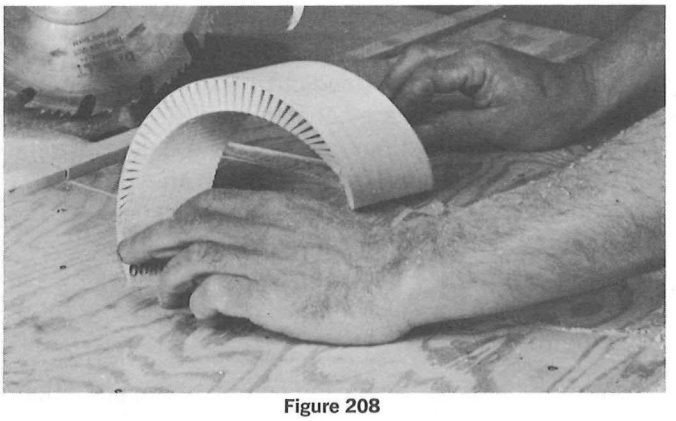


Figure 208

If you kerf a piece of lumber at an angle it will spiral.

2nd Method:

Pivot the lumber on a sturdy nail (or bolt it to the table). This pivot point should be 1/2 the diameter of the desired circle away from the 90° cross-cut kerf mark on the work table.

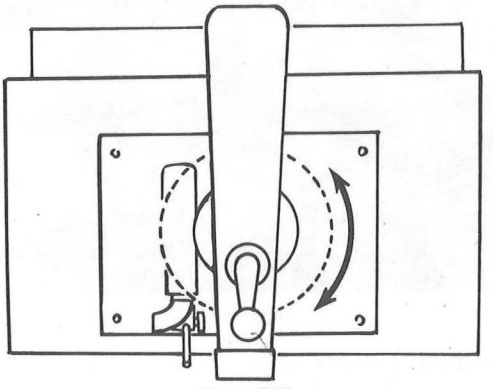


Figure 209

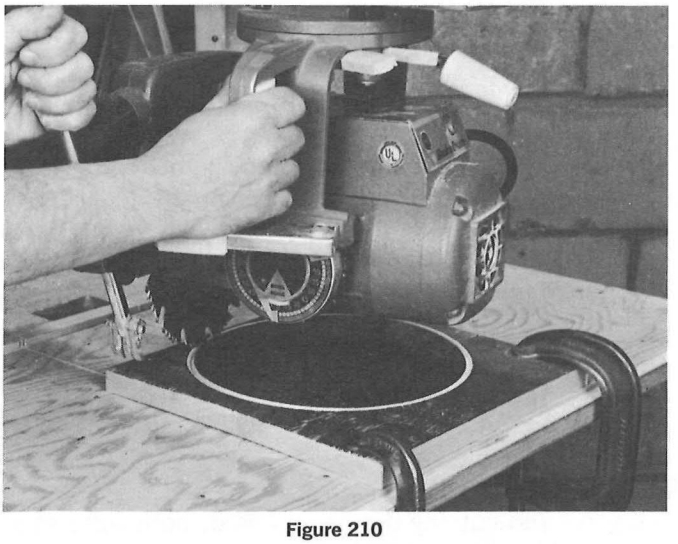


Figure 210

Circles 11 1/2" in diameter can be cut by swinging the saw on its yoke, lowering the blade 1/4 of a turn after each cut. Notice the scrap wood holding the yoke locator pin down.

Bring the blade tangent to this pivot point above the lumber and lock the rip-lock.

Clamp the lumber down and with the saw running, lower the blade 1/16" into the lumber.

Release the clamp, and with both hands rotate the lumber a complete turn. If the pivot is to the left of the blade rotate clockwise (feed-cut). If the pivot is to the right of the blade rotate counter-clockwise (feed-cut). Hold the lumber on the far side of the blade. Have the guard and the anti-kickback down so they are above the lumber a little more than the thickness of the lumber. **Only make this cut on lumber 20″ or wider.** Smaller circles can be cut this way by attaching the piece to be cut to a larger piece of plywood and rotating the plywood.

Lower the blade 1/16″ again and complete the operation.

Continue until the disc is **almost** cut out and then break off or cut off by hand the last cut.

Figure 211

3rd Method: The disc only—

Pivot the lumber the desired distance from the 90° miter of the cross-cut.

Clamp the lumber down.

Pull the saw forward, cutting off any lumber the blade engages.

Release the clamp and rotate the lumber 45° (the amount of rotation is not important).

Clamp the lumber again and cut off more lumber.

Continue releasing, clamping, turning and cutting until the disc is fairly round.

Elevate this disc on a piece of scrap and rotate it against the sanding disc for perfect smoothness of its edge.

Grills:

If you cross-cut any design on one or both sides of a piece of lumber and then rip off thin sections, gluing these sections together, grills can be made with thousands of different patterns. (See Figures 212, 213, 214.)

The illustrations at right show the cuts made with the bead and cove knives in two passes for each cross-grain shape. By raising or tilting, or both, you can get an infinite number of different shapes. These can be mixed with other shapes, saw cuts, and/or dado grooves.

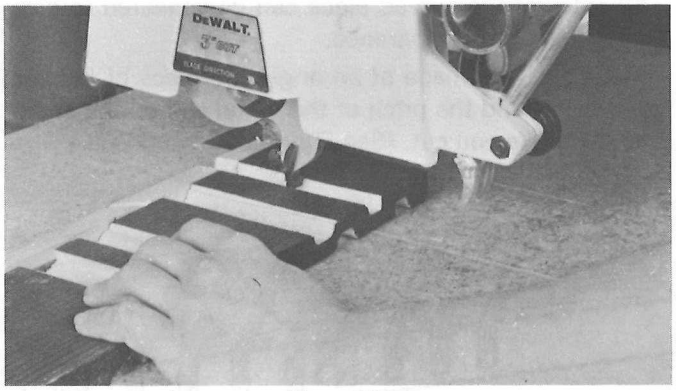


Figure 212

Make a series of cross grain shapes on the top and bottom of the lumber. Variations can be made by tilting the shaper, making double cuts or changing the cutter shape.

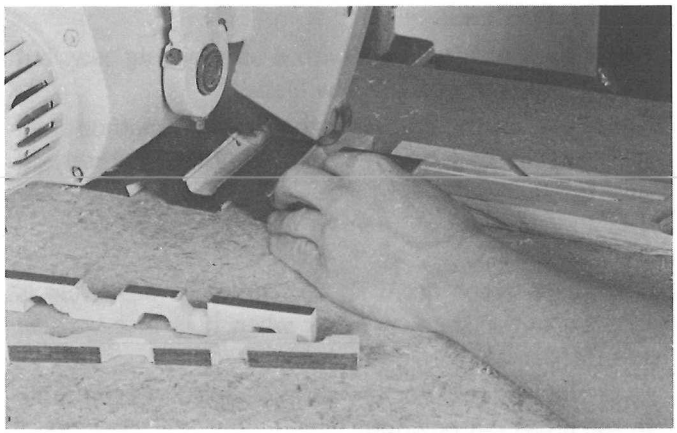


Figure 213

Slice off strips the desired width and glue the edges together. By slicing at an angle from opposite ends of the piece, the grill will zig-zag. By slicing at an angle, alternating top and bottom, the grill will form a circle. Its diameter depends upon the angles at which you slice. If you slice 45°, 30° and 60° the pieces can be glued together to form solid pierced looking posts. The variations of this operation are unlimited and a book on this subject alone would be enormous. You can derive a great deal of pleasure experimenting with these cuts.

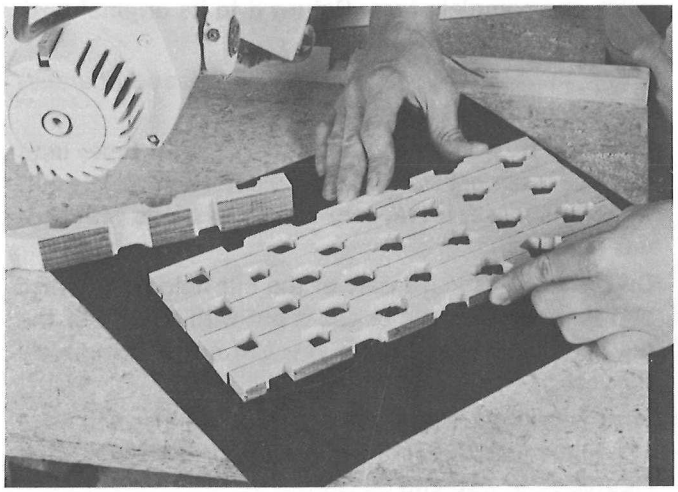


Figure 214

Sliced off cross grain shapes held together to form grill. All three designs cut with bead and cove knife at various depths, angles and locations.

If you rip the sections at an angle and glue them together, compound three-dimensionals will appear: again the variations are in the thousands. (See Figure 215.)

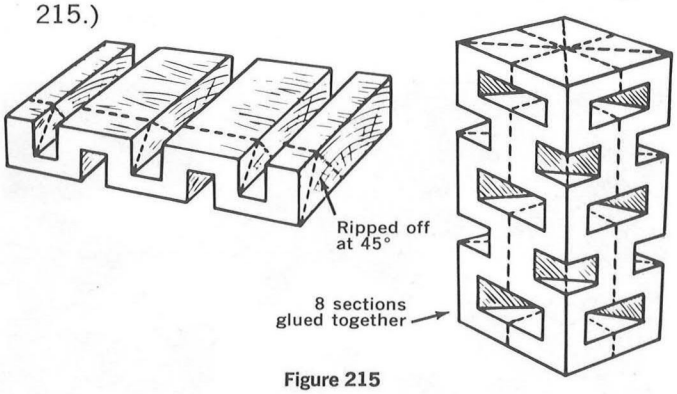


Figure 215

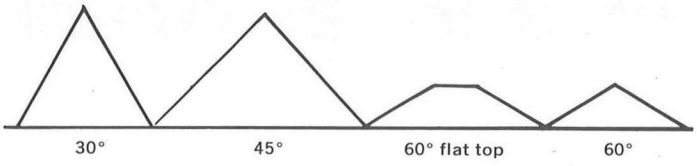


Figure 216

Compound Stars:

Pointed on top—These can be cut from any bevelled piece of lumber. The variations are almost limitless, but basically are made as follows:

Rip up the lumber into any isosceles triangle or any bisymmetrical shape. (See Figure 216.)

The first cut is a right hand compound cut with the bevel setting the same as the bevelled rip and the miter setting 45° for an 8 pointed star. (For any other number of points divide the number of points into 360° and set the miter to this angle. (See Figures 217, 218, 219, 220.)

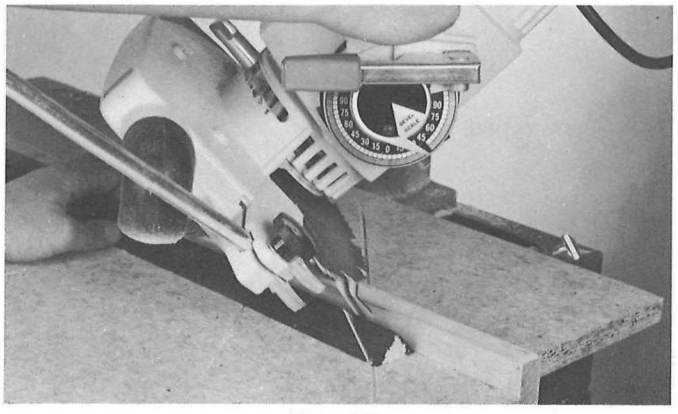


Figure 217

With the bevel at 45° and the miter at 45° first cut off a piece of scrap as shown.

The piece cut off on the right of the blade is scrap.

Rotate the lumber 180° against the fence and make a second cut so the saw blade cuts off one section of the star at its vertex.

Rotate the piece again and cut off a piece of scrap and repeat as before, cutting as many sections as needed.

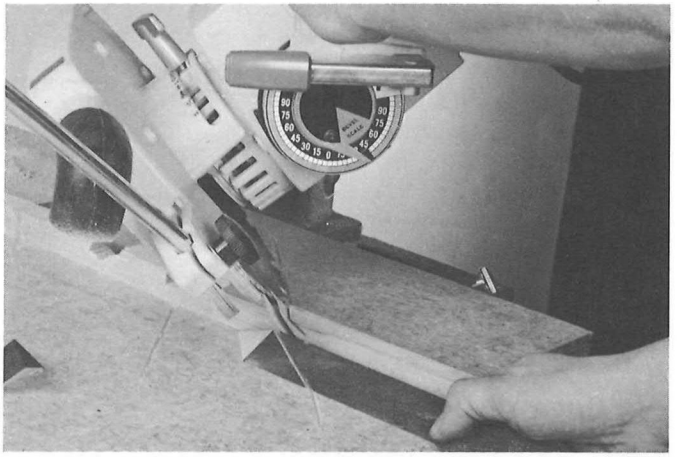


Figure 218

Rotate the triangular piece 180° and cut off the diamond. In order to make the second diamond another scrap piece must be cut off either end for the first cut. Then repeat as above.

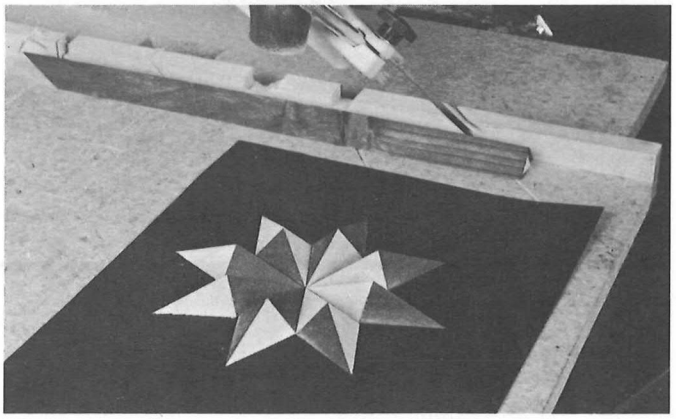


Figure 219

The diamonds can be glued to form a star or if placed side by side interesting harlequin designs can be formed. Before the stars were cut the lumber was stained thus giving more contrast to each diamond.

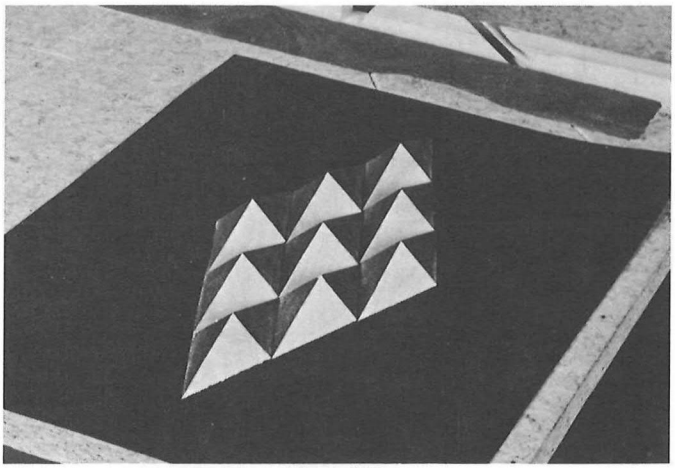


Figure 220

Diamonds can be assembled to form various patterns.

Compound Stars Flat on Top:

Rip up lumber beveled on one side and 90° on the other. (See Figure 221.)

The first cut is compound, the same as with the pointed top stars, with the 90° edge against the fence.

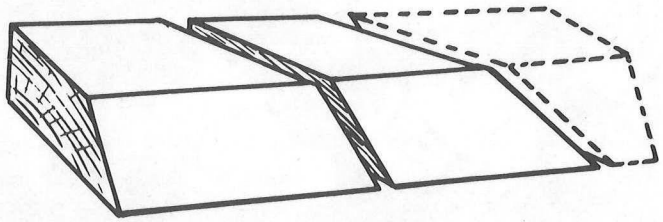


Figure 221

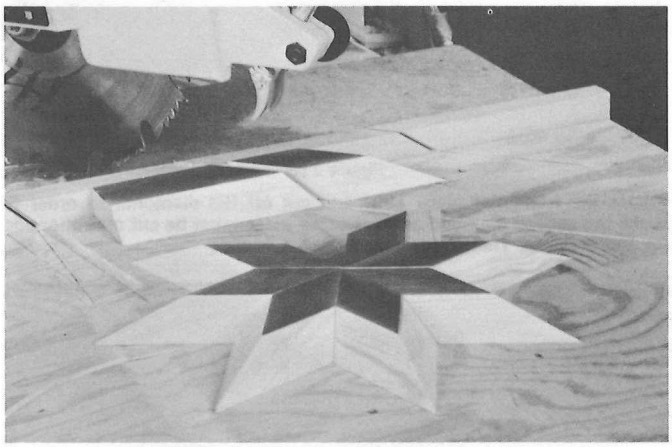


Figure 222

To make flat topped stars, the first cut is compound 45°, 45°, the second cut is 45° miter 90° bevel.

The second cut: **Do not rotate the lumber,** but set the bevel on the saw to 90° and cut off one section so the top is a perfect diamond shape. (See Figure 222,)

These sections are glued together to form a star. (See Figure 223.)

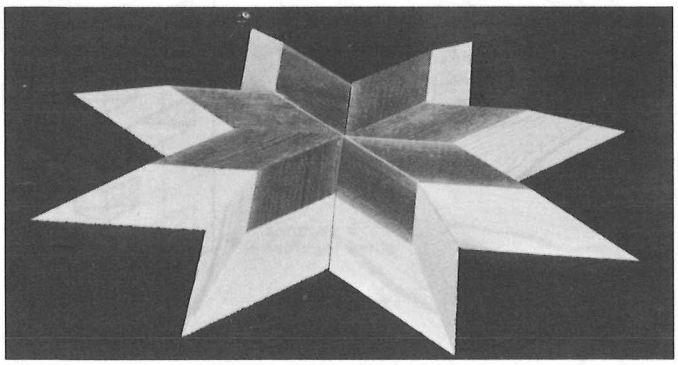


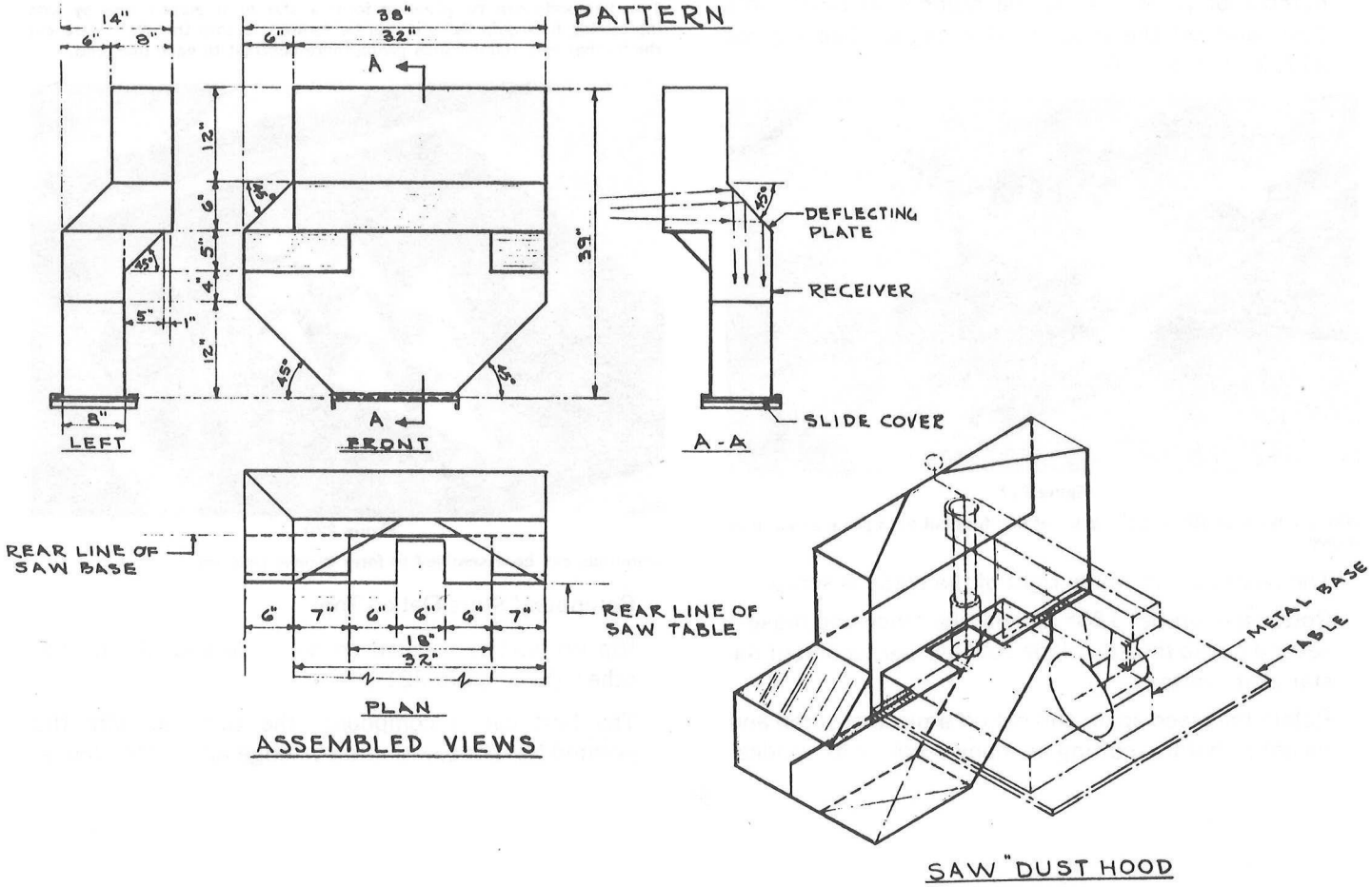
Figure 223

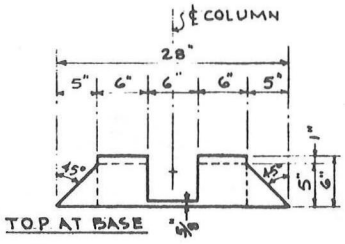
Completed flat topped star.

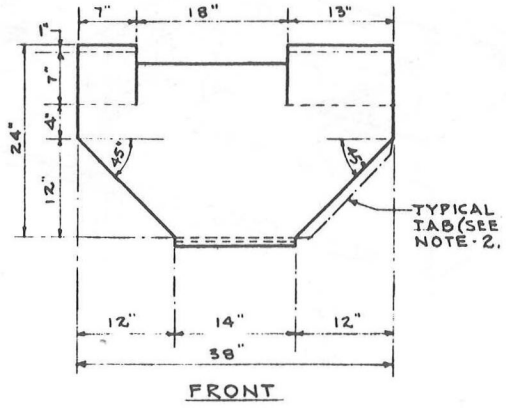
How to Build a Sawdust Catcher

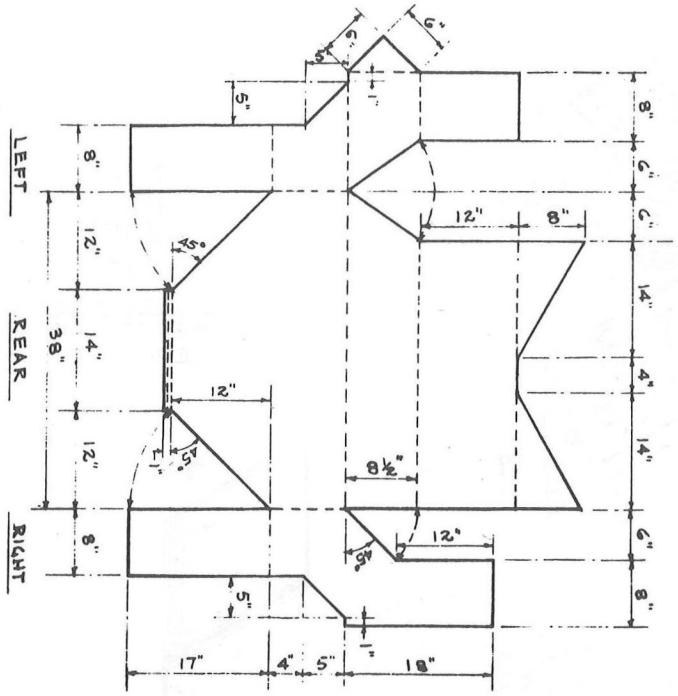
The **principle** of the hood: To direct the horizontal stream of sawdust down into the receiver by impingement against the 45° deflecting plate.

The **pattern** is for sheet metal. All views are inside. Dashed lines indicate bends. Continuous tabs for lapped, screwed or riveted joints are not shown but should be allowed for. The cover (not shown) can be hinged or sliding. This hood can be made of cardboard or sheet metal.



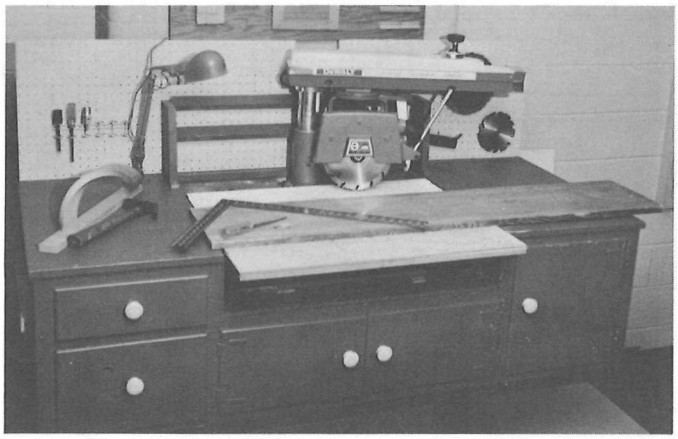






Built-in workbench

The ideal arrangement for your machine is to build it into, and make it part of, the workbench itself. The plan shown here features a complete shop in itself—permitting maximum storage and operational flexibility because of its two uses in one. The workbench not only houses the radial-arm machine, but also serves as a work table for other uses when the radial-arm is swung back against the tool board in the out-of-the-way position. Handy drawers and doors, and a pegboard attached to the back of the workbench offer ideal storage for the machine's accessories and hand tools. The space under the workbench is an excellent storage area for spare lumber and unfinished parts. Full construction details are given and the workbench is easy to complete. Actually, it can easily be your first project with the radial-arm machine. While building the bench, you can operate the machine on a pair of saw-horses.



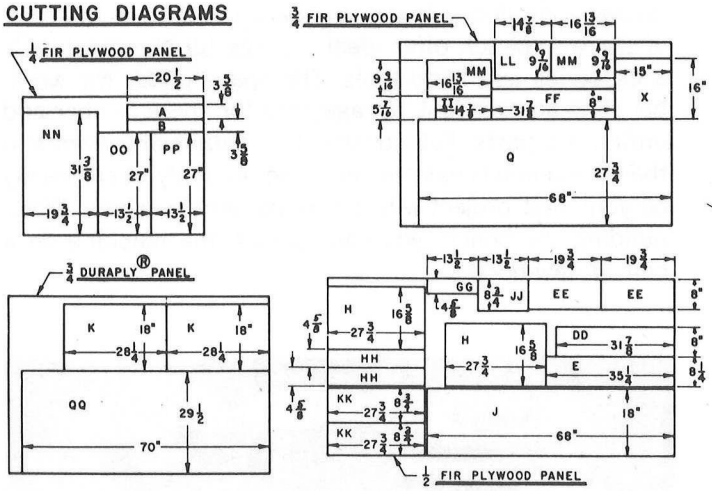
MATERIAL LIST

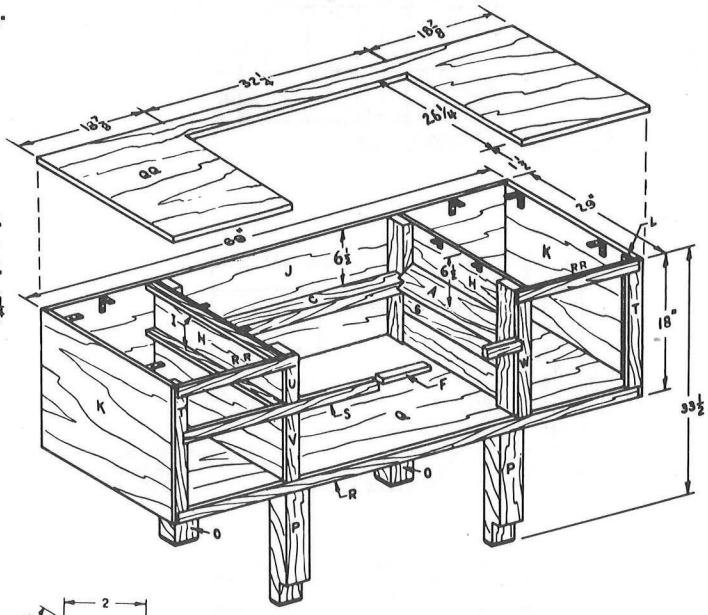
Note—All sizes in USE COLUMN are finish sizes

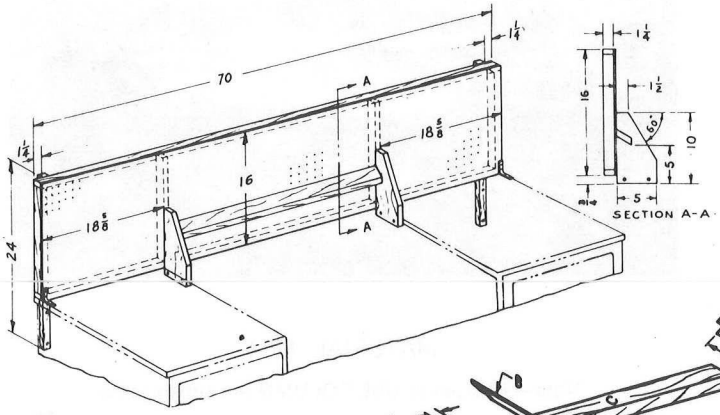
Buy	Use	Part	No. Required
	PINE		
2 pc. 1" x 2" x 12'	¾ x 1⅛ x 27¾	(I)	2
	¾ x 1⅜ x 50¼	(S)	1
	¾ x 1⅜ x 68¼	(R)	1
	¾ x 1⅜ x 18	(RR)	2
	¾ x 1½ x 16⅝	(L)	2
	¾ x 2 x 4⅞	(U)	1
	¾ x 2 x 9	(V)	1
1 pc. 1" x 3" x 7'	¾ x 2 x 15¼	(W)	1
	¾ x 2 x 18	(T)	2
	¾ x 2¼ x 7⅜	(F)	1
1 pc. 2" x 2" x 5'	1⅛ x 1¼ x 27¾	(M)	1
	1⅛ x 1¾ x 27¾	(N)	1
	FIR		
1 pc. 1½" x 1½" x 4'	1" x 1" x 6"	Handles	6
1 pc. 2" x 4" x 10'	1⅝ x 3⅝ x 20½	(G)	2
	1⅝ x 3⅝ x 35¼	(C)	1
	1⅝ x 3⅝ x 35¼	(D)	1
2 pc. 4" x 4" x 6'	3⅝ x 3⅝ x 33½	(O) (P)	4
	U.S. PLYWOOD MATERIAL (See Cutting Diagrams for details)		
1 pc. ¼" x 3' x 4'	*Weldwood® Fir Plywood		
1 pc. ½" x 4' x 8'	*Weldwood® Fir Plywood		
1 pc. ¾" x 4' x 6'	*Weldwood® Fir Plywood		
1 pc. ¾" x 4' x 6'	*Weldwood Duraply®		
	MISCELLANEOUS		
2" Angle Brackets			6
1" Angle Brackets			4
⅜" Offset Cabinet Hinges			6
Friction Catches			2
Wood Screws			
Nails			

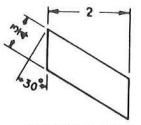
*Weldwood® is a registered trade mark for the products made by the United States Plywood Corporation . . . ask for them at your lumber dealer's.

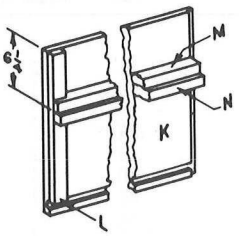
CUTTING DIAGRAMS



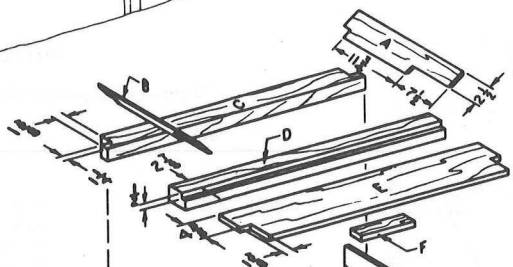


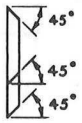




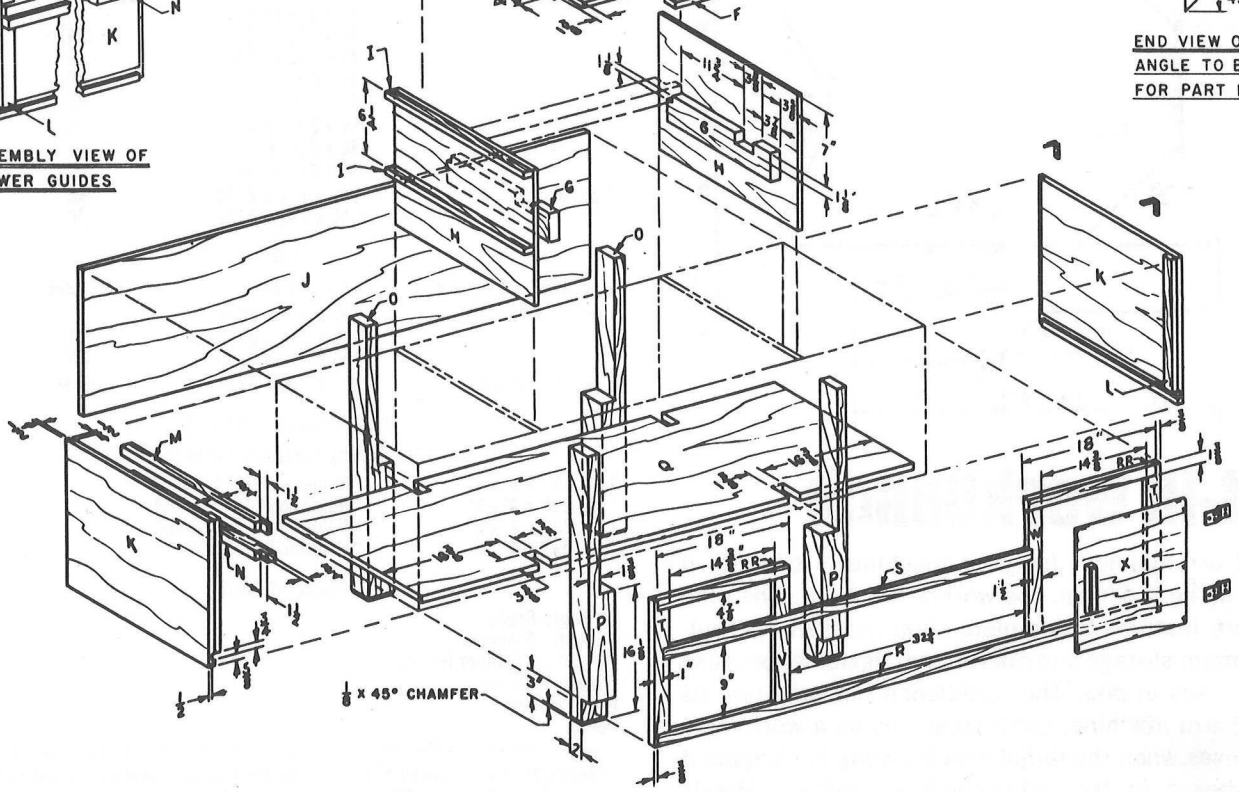


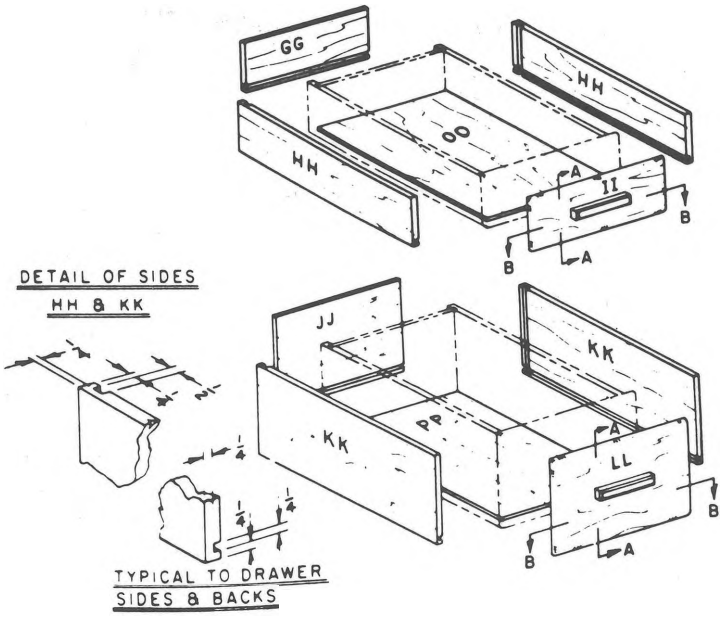
ASSEMBLY VIEW OF DRAWER GUIDES





END VIEW OF PART A ANGLE TO BE OPPOSITE FOR PART B




GG
HH
OO
HH
A
II
B
B
A
DETAIL OF SIDES
HH & KK
JJ
KK
PP
KK
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LL
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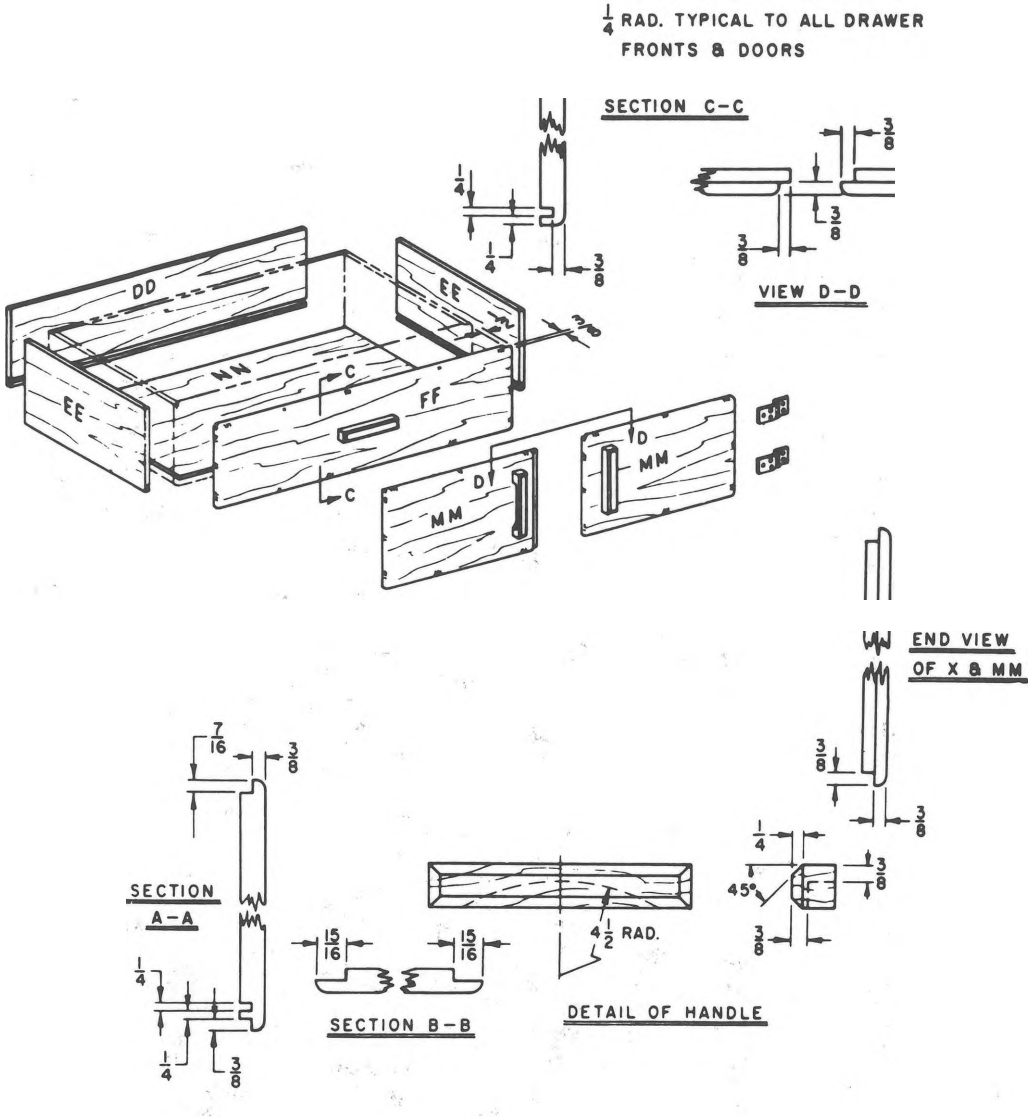
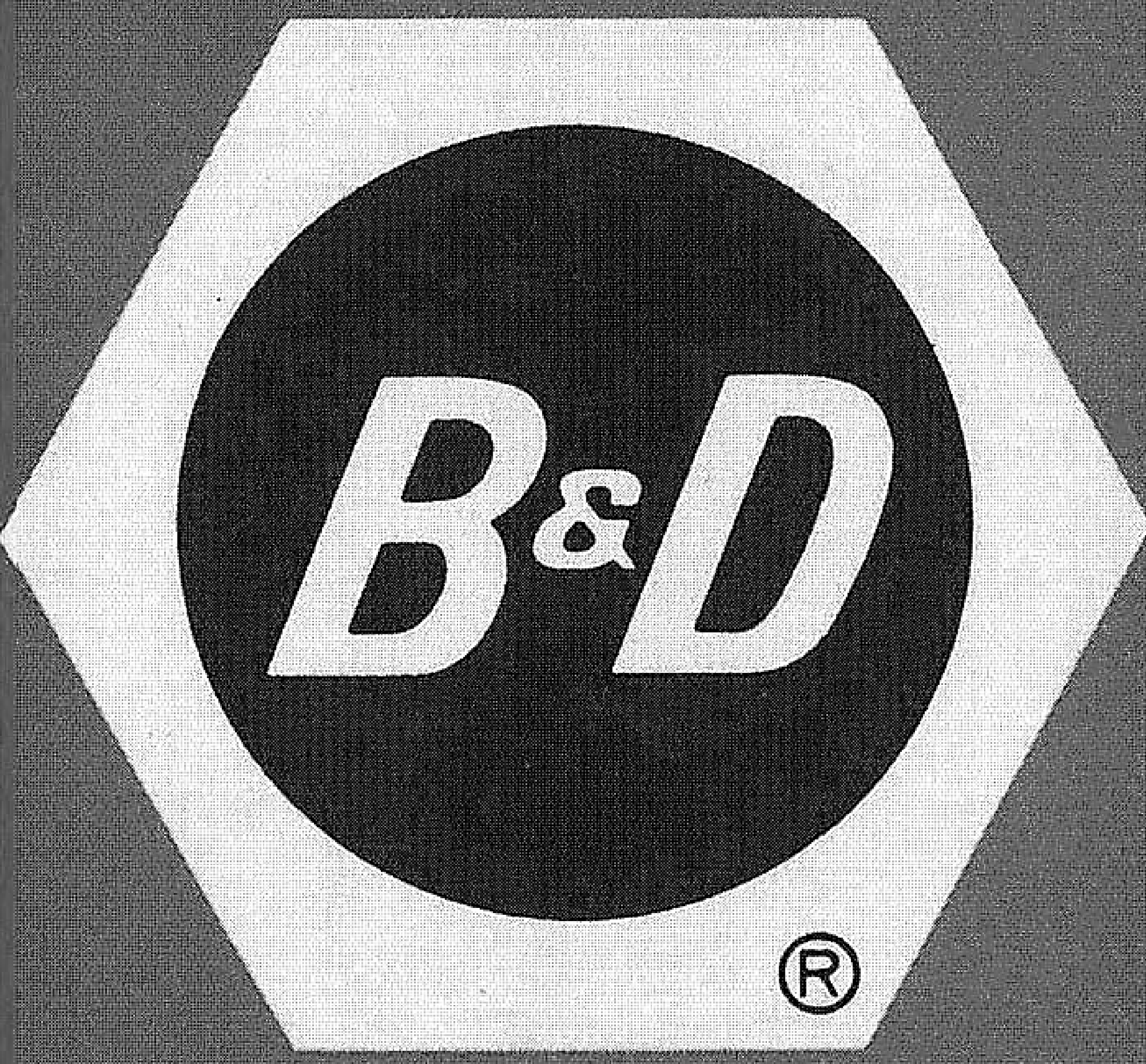
A
1/4
1/4
1/4
TYPICAL TO DRAWER
SIDES & BACKS


1/4 RAD. TYPICAL TO ALL DRAWER
FRONTS & DOORS
SECTION C-C
3/8
1/4
3/8
3/8
VIEW D-D
DD
EE
NN
C
FF
EE
C
D
MM
D
MM
END VIEW
OF X & MM
3/8
3/8
1/4
45°
3/8
3/8
7/16
3/8
SECTION
A-A
1/4
1/4
3/8
15/16
15/16
SECTION B-B
4 1/2 RAD.
DETAIL OF HANDLE


B&D
®